IN THE UNITED STATES DISTRICT COURT
FOR THE SOUTHERN DISTRICT OF TEXAS
HOUSTON DIVISION

GAIA TECHNOLOGIES, INC.	§	C.A. No. _____
Plaintiff,	§	H 93 3334
v.	§	
RECONVERSION TECHNOLOGIES, INC., RECONVERSION TECHNOLOGIES OF TEXAS, INC., RECYCLED PRODUCTS CORPORATION, JAMES E. TURNER, BETTY ROSE TURNER, GLYN TURNER, PROGRESSIVE CAPITAL CORPORATION, DAVID GORDON, IRA RIMER, JOEL HOLT, and RICHARD CLARK	§	
Defendants.	§	JURY TRIAL DEMANDED

PLAINTIFF'S ORIGINAL COMPLAINT

TO THE HONORABLE JUDGE OF SAID COURT:

COMES NOW, GAIA TECHNOLOGIES, INC. to file this its Original Complaint pursuant to Federal Rule of Civil Procedure 8 complaining of RECONVERSION TECHNOLOGIES, INC., RECONVERSION TECHNOLOGIES OF TEXAS, INC., RECYCLED PRODUCTS CORPORATION, JAMES E. TURNER, BETTY ROSE TURNER, GLYN TURNER, PROGRESSIVE CAPITAL CORPORATION, DAVID GORDON, IRA RIMER, JOEL HOLT, and RICHARD CLARK, and demanding a jury trial pursuant to Federal Rule of Civil Procedure 38(b) and for cause of action would respectfully show unto the Court and the Jury the following:

1. Plaintiff GAIA TECHNOLOGIES, INC. is a Delaware Corporation with its principal place of business at 10,000 Memorial Drive, Suite 750, Houston, Texas 77024.

2. Defendant RECONVERSION TECHNOLOGIES, INC. on information and belief is a Delaware corporation with its principal place of business at 1709 Highway 36N, Brenham, Texas 77833, and its agent for service of process is Delaware Corporate Services, P.O. Box 2306, Wilmington, Delaware 19899.

3. Defendant RECONVERSION TECHNOLOGIES OF TEXAS, INC. on information and belief is a Texas corporation with its principal place of business at 1709 Highway 36N, Brenham, Texas 77833, and its agent for service of process at that address is Betty Rose Turner.

4. Defendant RECYCLED PRODUCTS CORPORATION on information and belief is a Texas corporation with its principal place of business at 100 E. 2nd Street, Brenham, Texas 77833, and its agent for service of process is James E. Turner, 100 E. 2nd Street, Brenham, Texas 77833.

5. Defendant JAMES E. TURNER on information and belief is a Texas resident residing at 100 E. 2nd Street, Brenham, Texas 77833.

6. Defendant BETTY ROSE TURNER on information and belief is a Texas resident residing at 100 E. 2nd Street, Brenham, Texas 77833.

7. Defendant GLYN TURNER on information and belief is a Texas resident residing at 1310 Woodland Drive, Seabrook, Texas 77586.

8. Defendant PROGRESSIVE CAPITAL CORPORATION on information and belief is an Oklahoma corporation with its principal place of business at 610 Oneok Plaza, 100 W. Fifth Street, Tulsa, Oklahoma 74103 and may be served by serving its officer and/or director David Gordon at that address.

9. Defendant IRA RIMER on information and belief is a California resident who may be served at 610 Oneok Plaza, 100 W. Fifth Street, Tulsa, Oklahoma 74103.

10. Defendant DAVID GORDON on information and belief is an Oklahoma resident who may be served at 610 Oneok Plaza, 100 W. Fifth Street, Tulsa, Oklahoma 74103.

11. Defendant JOEL HOLT on information and belief is a North Carolina resident who may be served at 610 Oneok Plaza, 100 W. Fifth Street, Tulsa, Oklahoma 74103..

12. Defendant RICHARD CLARK on information and belief is an Oklahoma resident who may be served at 610 Oneok Plaza, 100 W. Fifth Street, Tulsa, Oklahoma 74103..

13. This is an action for patent infringement brought under the United States Patent Laws, 35 U.S.C. § 271. The action for trademark infringement is brought pursuant to violations of the Trademark Act, 15 U.S.C. § 1051 et seq. The action for unfair competition is brought pursuant to Section 43(a), 15 U.S.C. §1125 and the common laws of the State of Texas.. The RICO action is brought pursuant to 18 U.S.C. §1964(b) for violations of 18 U.S.C. §1341. The actions for tortious interference with trade secrets, tortious interference with prospective contractual relations, breaches of contracts, fraud, and conspiracy are brought pursuant to violations of the common laws of the State of Texas. The action for deceptive trade practices is brought under Tex. Bus. & Com. Code §17.50 pursuant to violations of Tex. Bus. & Com. Code §17.46(b)(12) and (23).

I.

JURISDICTION AND VENUE

14. Jurisdiction of this action is conferred upon this Court by 28 U.S.C. §1331, §1338(a), and §1338(b). Original jurisdiction for trademark infringement by the Defendants

is conferred upon this Court by 15 U.S.C. § 11, 21 and 28, 28 U.S.C. § 1331, 28 U.S.C. § 1338, and 28 U.S.C. § 1332. Jurisdiction of all common law causes of action are conferred on this court by 28 U.S.C. §1367(a).

15. Venue is proper in this action pursuant to 28 U.S.C. § 1400 and § 1391(b).

II.

BACKGROUND

16. U. S. Patent Nos. 4,003,408, 4,028,288, 4,110,420, 4,168,799, and 4,191,522, attached as Exhibits A - E (hereinafter "the patents"), were duly and legally issued and Plaintiff is the owner of such patents relating to Leaky Pipe® and Hard Goods technology.

17. Plaintiff has placed the required statutory notice on the packaging of all goods manufactured and sold under the letters patent listed above.

18. Plaintiff is the owner of Trademark No. 1,703,285 relating to the mark Leaky Pipe®.

19. The Trademarks of Plaintiff contain the required notice to Defendants.

20. On or about August 19, 1991, Plaintiff was assigned the patents and trademarks, effective as of that date. Plaintiff has assigned no rights in the patents or trademarks to the Defendants.

21. Defendants have for a long time past infringed and continue to infringe the Plaintiff's letters patent issued under 35 U.S.C. by making, selling, and using Leaky Pipe® and Hard Goods technology and products covered by the patents and/or by inducing others to infringe the patents and will continue to do so unless enjoined by this Court.

22. Defendants have for a long time past and still are infringing the Trademark listed above by making, selling and using products under the name "Leaky Pipe" and displaying the trademarks of Plaintiff thus causing a likelihood of confusion to the purchasing public.

23. Defendant JAMES E. TURNER is the inventor of the subject matter covered by the patents. U.S. Patents No. 4,003,408, entitled "Underground Irrigation Porous Pipe," and 4,168,799, entitled "Soaker Hose," cover flexible porous pipe which is made from a mixture of elastomers and polyethylene binder. U.S. Patent No. 4,110,420, entitled "Method for Extruding Porous Irrigation System," covers the extrusion method for producing the porous pipe. U.S. Patent No. 4,028,288, entitled "Moldable End Products from Primarily Reclaimable Waste Material" covers products containing a mixture of crumbed rubber tires and moldable resin thermoplastic material bits. U.S. Patent No. 4,191,522, entitled "Extruding Machine and End Products," covers an apparatus for molding products, most specifically those products covered by the '288 patent, wherein the apparatus has a hollow mold, a plug, an input supply line, a material input port, a pressurized heat fused flowable material source, and an enclosure for chilling the ambient air surrounding the mold.

24. During the 1980's, Defendant JAMES E. TURNER attempted to market products covered by the patents under the names Leaky Pipe® and Hard Goods. Leaky Pipe® included porous irrigation products while Hard Goods covered molded products such as fence posts, boards, and the like which had been extruded and molded from crumbed rubber waste. These products were sold through a company called Entek Corporation in which Defendant JAMES E. TURNER was president. In 1990, Entek and Defendant JAMES E. TURNER declared bankruptcy and the assets of Entek were placed under the control of the bankruptcy court of the

Northern District of Texas, Dallas Division (*See In re Entek Corporation*, Case No. 391-31143-HCA-11; and *In re James E. Turner,* Case No. 391-31144-HCA-11). These assets included rights to the intellectual property of both Entek and JAMES E. TURNER, inventory of Leaky Pipe®, equipment for producing Leaky Pipe®, and equipment for producing Hard Goods.

25. Banstar Corporation, the predecessor in interest to Plaintiff GAIA TECHNOLOGIES, INC., offered to purchase the assets of Entek Corporation through the bankruptcy court. On touring Entek's facilities, representatives of Banstar Corporation noticed that both the inventory of Leaky Pipe® and the equipment for producing Hard Goods had been removed without the consent of the bankruptcy court. Thus, Banstar Corporation limited its offer to the purchase of the intellectual property rights associated to Leaky Pipe® and Hard Goods and the equipment for manufacturing Leaky Pipe®. The sale of these assets from Entek Corporation and Defendant JAMES E. TURNER to Banstar Corporation was approved by the bankruptcy court on August 9, 1991, *see* Order Approving the Sale of Assets to Banstar Corporation, attached as Exhibit F, and completed through an Asset Purchase Agreement transferring the above listed assets from Entek Corporation to Banstar Corporation and an Assignment of Technology assigning all of JAMES E. TURNER's and Entek Corporation's rights in the patents and trademarks and intellectual property relating to the patents to Banstar Corporation. These documents were executed in the state of Texas on August 19, 1991 by Defendant JAMES E. TURNER and Mr. Henry Sullivan, president of Banstar Corporation. Within paragraph 2 of the Assignment of Technology, attached as Exhibit G, Defendant JAMES E. TURNER, as an Assignor, agreed to "cooperate fully . . . in the protection and enforcement of Banstar's rights in and to the Technology."

26. Contemporaneous to the bankruptcy proceedings, Defendant JAMES E. TURNER also entered into an Employment Agreement, attached as Exhibit H, with Banstar Corporation on June 14, 1991. However, on August 7, 1991, a termination of the agreement was executed between Banstar Corporation and Defendant JAMES E. TURNER contingent on Defendant JAMES E. TURNER accomplishing the technology transfer of the above listed patents and trademarks. *See* Release Letter, attached as Exhibit I. To encourage Banstar Corporation's purchase of the patent rights, Defendant JAMES E. TURNER represented in paragraph 4(e) of the Employment Agreement that there were no outstanding licenses on any of the patents. Paragraph 6 of the Employment Agreement further contained a two year covenant not to compete or disclose trade secrets on the part of Defendant JAMES E. TURNER, such covenant specifically stating that it would survive the termination of the Employment Agreement. This covenant not to compete was reasonable in duration and necessary to protect the business of the Plaintiff.

27. In entering the Asset Purchase Agreement, Banstar Corporation relied upon Defendant JAMES E. TURNER's representations that no outstanding licenses to the technology were in existence. Plaintiff GAIA TECHNOLOGIES has subsequently discovered that such representations were false and misleading, as an outstanding license agreement was in existence between Defendant JAMES E. TURNER and an Icelandic company at the time of the execution of the Assignment of Technology and Asset Purchase Agreement.

28. Defendant JAMES E. TURNER has further failed to deliver to Plaintiff all of the assets and books of Entek Corporation as was contracted for in the Asset Purchase Agreement. *See* Attorney's Letter, attached as Exhibit J. In fact, a Leaky Pipe® advertising brochure,

attached as Exhibit K, which was part of Entek's assets is being distributed by Defendant RECYCLED PRODUCTS CORPORATION. In this brochure, it may be noted on page 4 that Entek's name has been deleted and Defendant's name and address have been inserted.

29. While Entek and Defendant JAMES E. TURNER were in bankruptcy, Defendant JAMES E. TURNER caused Defendant RECYCLED PRODUCTS CORPORATION to be incorporated on February 11, 1991, listing Defendant JAMES E. TURNER as its President. On behalf of Defendant RECYCLED PRODUCTS CORPORATION, Defendants JAMES TURNER, GLYN TURNER, and BETTY ROSE TURNER, acting in concert, advertised Leaky Pipe® products in newsletters sent through the U.S. mail and directed toward GAIA's potential customers both in and outside of Texas. *See* Newsletters, attached as Exhibits L and M. In these newsletters, the patents were disparaged as "irrelevant" and it was asserted that Plaintiff GAIA TECHNOLOGIES, INC. had no rights in Hard Goods technology or in future Leaky Pipe® technology. These repeated false, misleading, and material misrepresentations were made with knowledge of their falsity or at least a complete reckless disregard for the truth on the part of these Defendants. Further, these mailings were made possible only through the improper use of the confidential proprietary information and trade secrets improperly disclosed by Defendant JAMES E. TURNER, in breach of his duties to Plaintiff.

30. As shown by Exhibits L and M, since on or about November, 1991 despite having no manufacturing facility, Defendants JAMES TURNER, GLYN TURNER, BETTY ROSE TURNER, and RECYCLED PRODUCTS CORPORATION, acting in concert, have blatantly advertised and sold Leaky Pipe® products. As discussed in Exhibit J, this Leaky Pipe® is most assuredly those missing from Entek's inventory.

31. On information and belief, Defendant DAVID GORDON is president and Chief Executive Officer of Defendant RECONVERSION TECHNOLOGIES OF TEXAS, INC. Control over Defendant RECONVERSION TECHNOLOGIES OF TEXAS, INC. has been and continues to rest in the hands of Defendants JAMES E. TURNER, DAVID GORDON, RICHARD CLARK, IRA RIMER, and JOEL HOLT through stock ownership, proxies, and directorships. Defendant RECONVERSION TECHNOLOGIES OF TEXAS, INC.'s manufacturing facility in Brenham, Texas is equipped to manufacture extruded and molded products from rubber waste. Since on or before its incorporation on February 24, 1992, Defendant RECONVERSION TECHNOLOGIES OF TEXAS, INC. has been and is now selling Leaky Pipe® products and manufacturing and selling Hard Goods products which infringe the patents and trademarks of the Plaintiff. *See* Retek Pricing Guide, attached as Exhibit N; Retek Advertisement, attached as Exhibit O; Retek Offer Letter, attached as Exhibit P; and Purchase Order Check, attached as Exhibit R. The Leaky Pipe® inventory and Hard Goods manufacturing equipment was acquired from Defendant JAMES E. TURNER.

32. Defendant JAMES E. TURNER has been and continues to be employed by Defendant RECONVERSION TECHNOLOGIES OF TEXAS, INC. for the purpose of aiding in the manufacture and sale of Hard Goods and Leaky Pipe® products. His employment and the manufacturing and sale has continued even with knowledge on the part of Defendants RECONVERSION TECHNOLOGIES OF TEXAS, INC., DAVID GORDON, RICHARD CLARK, IRA RIMER, and JOEL HOLT of Defendant JAMES E. TURNER's bankruptcy sale, his covenant not to compete, and the Assignment of Technology to Plaintiff.

33. Through the employment of Defendant JAMES E. TURNER, Defendants RECONVERSION TECHNOLOGIES OF TEXAS, INC., DAVID GORDON, RICHARD CLARK, IRA RIMER, and JOEL HOLT have received confidential information and trade secrets of Plaintiff GAIA TECHNOLOGIES, INC. The manufacturing and sale of Defendant RECONVERSION TECHNOLOGIES OF TEXAS, INC.'s products were made possible only through concerted action of these Defendants and the improper use of confidential information and trades secrets of Plaintiff GAIA TECHNOLOGIES, INC. improperly disclosed by Defendant JAMES E. TURNER to Defendants RECONVERSION TECHNOLOGIES OF TEXAS, INC., DAVID GORDON, RICHARD CLARK, IRA RIMER, and JOEL HOLT.

34. Around the fall of 1992, Defendant RECONVERSION TECHNOLOGIES OF TEXAS, INC. was acquired by Horizon Capital Corporation, a Delaware corporation. Financing of this purchase through the sale of stock was arranged by Defendant PROGRESSIVE CAPITAL CORPORATION, a group consisting of Defendants DAVID GORDON, RICHARD CLARK, IRA RIMER, and JOEL HOLT. On or about October 11, 1992 a reverse merger was performed, resulting in a new parent company named RECONVERSION TECHNOLOGIES, INC. Corporate control over Defendant RECONVERSION TECHNOLOGIES, INC. has been and continues to rest in the hands of Defendants JAMES E. TURNER, DAVID GORDON, RICHARD CLARK, IRA RIMER, and JOEL HOLT through stock ownership, proxies, and directorships. The financing for this transaction was solicited in part through the U.S. mail and contained false representations as to these Defendants' rights to produce and sell Leaky Pipe® and Hard Goods.

35. As a result of the reverse merger, Defendant RECONVERSION TECHNOLOGIES, INC. now acts as a single entity with Defendant RECONVERSION TECHNOLOGIES OF TEXAS, INC.

36. At the direction of Defendants JAMES E. TURNER, DAVID GORDON, RICHARD CLARK, IRA RIMER, and JOEL HOLT, Defendant RECONVERSION TECHNOLOGIES, INC. has manufactured and sold and continues to manufacture and sell products which infringe the patents and trademarks of the Plaintiff. The manufacturing and sale of such products was made possible through the concerted action of these Defendants and the improper use of the confidential information and trades secrets of Plaintiff GAIA TECHNOLOGIES, INC. improperly disclosed by Defendant JAMES E. TURNER,. This infringement is clearly knowing and intentional as at all times Defendant JAMES E. TURNER, in violation of his covenant not to compete, has been a director and or in the employment of both RECONVERSION TECHNOLOGIES, INC. and RECONVERSION TECHNOLOGIES OF TEXAS, INC.

37. The acts of these Defendants have caused and continue to cause irreparable harm to Plaintiff GAIA TECHNOLOGIES, INC which will continue unless such acts are properly enjoined by this Court. These Defendants have improperly acquired and used Plaintiff's trade secrets and confidential information, the acquisition of which has allowed these Defendants to enter the field of Leaky Pipe® and Hard Goods technology and unfairly compete with the Plaintiff. These Defendants have, through their concerted acts, injured the business and goodwill of Plaintiff by disparaging Plaintiff's name and its Leaky Pipe® and Hard Goods technology to Plaintiff's current and potential customers, and have caused a likelihood of

confusion between Plaintiff's and Defendant's products. Further, Plaintiff has lost sales that it otherwise might have had it not been for the Defendants' acts.

III.

CAUSES OF ACTION

38. Based on the allegations contained herein in paragraphs 1 - 37 Plaintiff is entitled to a claim of patent infringement against Defendants RECONVERSION TECHNOLOGIES, INC., RECONVERSION TECHNOLOGIES OF TEXAS, INC., RECYCLED PRODUCTS CORPORATION, and JAMES E. TURNER. Plaintiff is entitled to a claim for inducement to infringe against Defendants RECONVERSION TECHNOLOGIES, INC., RECONVERSION TECHNOLOGIES OF TEXAS, INC., RECYCLED PRODUCTS CORPORATION, JAMES E. TURNER, BETTY ROSE TURNER, GLYN TURNER, PROGRESSIVE CAPITAL CORPORATION, DAVID GORDON, IRA RIMER, JOEL HOLT, and RICHARD CLARK. Such acts of the Defendants were intentional and wilful and Plaintiff requests that it receive actual damages and attorney's fees for such infringement as this is an exceptional case.

39. Based on the facts outlined herein in paragraphs 1 - 37 Plaintiff is entitled to a claim for trademark infringement under 15 U.S.C. §1114 against Defendants RECONVERSION TECHNOLOGIES, INC., RECONVERSION TECHNOLOGIES OF TEXAS, INC., RECYCLED PRODUCTS CORPORATION, JAMES E. TURNER, BETTY ROSE TURNER, and GLYN TURNER. Such acts of the Defendants were intentional, wilful, and done with knowledge of the likelihood of confusion between Defendants' and Plaintiff's products and Plaintiff requests that it receive defendants' profits, damages, and costs as well as attorneys' fees under 15 U.S.C. §1117 as this is an exceptional case.

40. Based on the facts outlined herein in paragraphs 29 - 31, and 36, Plaintiff is entitled to a claim for unfair competition under 15 U.S.C. §1125(a) for false designation of affiliation, connection and association against Defendants RECONVERSION TECHNOLOGIES, INC., RECONVERSION TECHNOLOGIES OF TEXAS, INC., RECYCLED PRODUCTS CORPORATION, JAMES E. TURNER, BETTY ROSE TURNER, GLYN TURNER, PROGRESSIVE CAPITAL CORPORATION, DAVID GORDON, RICHARD CLARK, IRA RIMER, and JOEL HOLT. Due to the intentional and wilful nature of the acts of the Defendants, Plaintiff is entitled to defendants' profits, damages, and costs as well as attorneys' fees under 15 U.S.C. §1117 as this is an exceptional case.

41. Based on the facts contained herein in paragraphs 29, 30, 32, 33, and 36, Plaintiff is entitled to common law claims of unfair competition for misappropriation of trade secrets and confidential information against Defendants RECONVERSION TECHNOLOGIES, INC., RECONVERSION TECHNOLOGIES OF TEXAS, INC., RECYCLED PRODUCTS CORPORATION, JAMES E. TURNER, BETTY ROSE TURNER, GLYN TURNER, and PROGRESSIVE CAPITAL CORPORATION, DAVID GORDON, RICHARD CLARK, IRA RIMER, and JOEL HOLT, and for the use of Plaintiff's registered trademark without authorization against Defendants RECONVERSION TECHNOLOGIES, INC., RECONVERSION TECHNOLOGIES OF TEXAS, INC., RECYCLED PRODUCTS CORPORATION, JAMES E. TURNER, BETTY ROSE TURNER, and GLYN TURNER. Due to the intentional and wilful nature of the acts of the Defendants, Plaintiff is entitled to punitive damages.

42. Based on the allegations contained herein in paragraphs 25 and 29, Plaintiff is entitled to a RICO claim for false representations through the mail designed for the purpose of obtaining money by persons maintaining an interest in an enterprise which is engaged in interstate commerce under 18 U.S.C. §1964 for violations of 15 U.S.C. §§1341 and 1343 against Defendants RECYCLED PRODUCTS CORPORATION, JAMES E. TURNER, BETTY ROSE TURNER, and GLYN TURNER. Based on the allegations contained herein in paragraphs 25 and 34, Plaintiff is entitled to a RICO claim under 18 U.S.C. §1964 for violations of 15 U.S.C. §§1341 and 1343 against Defendants PROGRESSIVE CAPITAL CORPORATION, DAVID GORDON, RICHARD CLARK, IRA RIMER, JOEL HOLT, RECONVERSION TECHNOLOGIES, INC. and RECONVERSION TECHNOLOGIES OF TEXAS, INC.

43. Based on the allegations contained herein in paragraphs 26, 29, 30, 32, 33, and 36, Plaintiff is entitled to a claim of tortious interference with trade secrets against Defendants RECONVERSION TECHNOLOGIES, INC., RECONVERSION TECHNOLOGIES OF TEXAS, INC., RECYCLED PRODUCTS CORPORATION, JAMES E. TURNER, BETTY ROSE TURNER, GLYN TURNER, PROGRESSIVE CAPITAL CORPORATION, DAVID GORDON, IRA RIMER, JOEL HOLT, and RICHARD CLARK.

44. Based on the allegations contained herein, Plaintiff is entitled to a claim of tortious interference with prospective contractual relations against Defendants RECONVERSION TECHNOLOGIES, INC., RECONVERSION TECHNOLOGIES OF TEXAS, INC., RECYCLED PRODUCTS CORPORATION, JAMES E. TURNER, BETTY ROSE TURNER,

GLYN TURNER, PROGRESSIVE CAPITAL CORPORATION, DAVID GORDON, IRA RIMER, JOEL HOLT, and RICHARD CLARK.

45. Based on the allegations contained herein in paragraphs 26 and 29 - 37, Plaintiff is entitled to a claim of breach of contract against Defendant JAMES E. TURNER for breach of his covenant not to compete in the Employment Agreement.

46. Based on the allegations contained herein in paragraph 25 and 29 - 37, Plaintiff is entitled to a claim of breach of contract against Defendant JAMES E. TURNER for breach of covenants contained in the Assignment of Technology.

47. Based on the allegations contained herein in paragraph 28, Plaintiff is entitled to a claim of breach of contract against Defendant JAMES E. TURNER for breach of the Asset Purchase Agreement.

48. Based on the allegations contained herein, Plaintiff is entitled to a claim of tortious interference with contractual relations against Defendants RECONVERSION TECHNOLOGIES, INC., RECONVERSION TECHNOLOGIES OF TEXAS, INC., RECYCLED PRODUCTS CORPORATION, BETTY ROSE TURNER, GLYN TURNER, PROGRESSIVE CAPITAL CORPORATION, DAVID GORDON, IRA RIMER, JOEL HOLT, and RICHARD CLARK for inducing JAMES E. TURNER's breach of his covenant not to compete and of the covenants contained within the Assignment of Technology.

49. Based on the allegations contained herein in paragraphs 27, Plaintiff is entitled to claims of fraud against Defendant JAMES E. TURNER arising out of the formation of the Employment Agreement.

50. Based on the allegations contained herein in paragraphs 27 and 29, Plaintiff is entitled to claims of fraud against Defendant JAMES E. TURNER relating to the formation of the Assignment of Technology.

51. Based on the allegations contained herein in paragraphs 29 - 36 , Plaintiff is entitled to a claim of conspiracy to injure the business of GAIA TECHNOLOGIES, INC. against Defendants RECONVERSION TECHNOLOGIES, INC., RECONVERSION TECHNOLOGIES OF TEXAS, INC., RECYCLED PRODUCTS CORPORATION, JAMES E. TURNER, BETTY ROSE TURNER, GLYN TURNER, PROGRESSIVE CAPITAL CORPORATION, DAVID GORDON, IRA RIMER, JOEL HOLT, and RICHARD CLARK.

52. The acts complained herein in paragraph 25 - 27 give Plaintiff a cause of action under Tex. Bus. & Rem. Code §17.50 for violations of §§17.46(b)(12) and (23) of the Texas Deceptive Trade Practice Act by Defendant JAMES E. TURNER. The acts of Defendant were intentional and therefore the Court should award enhanced damages.

WHEREFORE, Plaintiff demands a jury trial pursuant to Federal Rule of Civil Procedure 38(b) and respectfully prays for the following:

A. A Preliminary and Final Injunction against the Defendants, their agents, servants and employees against the continued infringement, inducement to infringe and contributory infringement of Plaintiff's patents;

B. A Preliminary and Final Injunction against the continued infringement of Plaintiff's trademarks by the Defendants;

C. Actual and punitive damages for statutory and common law unfair competition by the Defendants;

D. Enhanced damages under 35 U.S.C. §284 for patent infringement and inducement to infringe due to the intentional and wilful nature of the acts of the Defendants;

E. Defendant's profits, actual and enhanced damages, and costs for trademark infringement by Defendants and attorneys fees as this is an exceptional case;

F. Actual and enhanced damages and attorney's fees for violations of the Deceptive Trade Practices Act by Defendant JAMES E. TURNER;

G. Actual and exemplary damages for common law fraud by Defendant JAMES E. TURNER;

H. Actual and exemplary damages for tortious interference with prospective contractual relations by each Defendant;

I. Actual and exemplary damages for tortious interference with trade secrets by each Defendant;

J. Actual and exemplary damages for tortious interference with contractual relations by each Defendant;

K. Incidental and consequential damages for breach of contract by Defendant JAMES E. TURNER;

L. Actual and exemplary damages for conspiracy by each Defendant;

M. Treble damages, costs, and attorneys fees for violations of 18 U.S.C. §1964 by each Defendant;

N. Pre-Judgment and Post Judgment interest as allowed by law;

O. Costs of Court and attorney's fees and such other and further relief to which Plaintiff may show itself justly entitled.

RESPECTFULLY SUBMITTED,

MATTHEWS & ASSOCIATES

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United States Patent [19]

Turner

[11] 4,003,408

[45] Jan. 18, 1977

[54] UNDERGROUND IRRIGATION POROUS PIPE

[75] Inventor: James E. Turner, Southlake, Tex.

[73] Assignee: George C. Ballas, trustee, Houston, Tex.

[22] Filed: Feb. 26, 1974

[21] Appl. No.: 445,866

[52] U.S. Cl. 138/118; 138/177; 239/145

[51] Int. Cl.² F16L 11/04

[58] Field of Search ..... 138/118, 177, 178, DIG. 1; 264/53; 239/145; 210/170, 497

[56] References Cited

UNITED STATES PATENTS

1,254,906	1/1918	Henderson	138/40
1,989,427	1/1935	Robey	239/145
2,645,249	7/1953	Davis et al.	138/118
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2,807,505	9/1957	Weitzel	239/269 X
3,774,648	11/1973	Edlin	138/177

Primary Examiner—Richard E. Aegerter
Assistant Examiner—Frederick R. Schmidt
Attorney, Agent, or Firm—Bard, Springs & Jackson

[57] ABSTRACT

A porous pipe primarily of rubber and synthetic rubber reclaimed from rubber tires, ground to a relatively small granular size, with metal removed; such as, for example, would pass through a 30-mesh screen, process-mixed through a pipe extruder, with a much smaller binder mix of primarily polyethylene, along with vinyl, ABS binder, and a trace of attuclay. The resulting product is useful as a subsurface irrigation buried pipe, having high structural integrity effectively resisting soil-loading pipe collapse, and it even resists collapse from moderately large rocks in the soil, and yet has a high degree of flexibility along its length. A pipe is provided with cross sectional area of pipe wall more than twice the cross sectional area of the pipe opening. It is a water-leaking pipe formed in the process through the extruder with limited foaming from steam originating from absorbed moisture in the ground, reclaimed rubber tire material, and from residual gasses venting from the material mix, with product mix heating in the extruder, forming some open cell fluid flow paths. The foaming with steam and gasses from the mix also form labyrinth passageways between the rubber tire granuals and the polyethylene binder mix, and also through the binder mix that is non-compatible with the rubber granules but that forms a physical interconnective structural material binder therefor.

7 Claims, 8 Drawing Figures

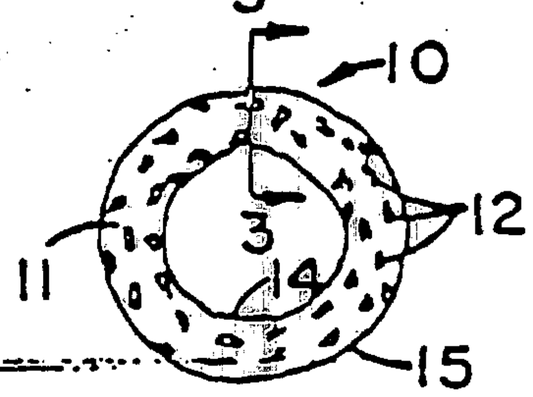

EXHIBIT A

205879

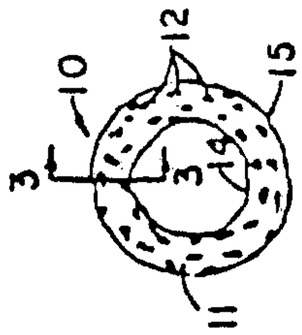

FIG. 2

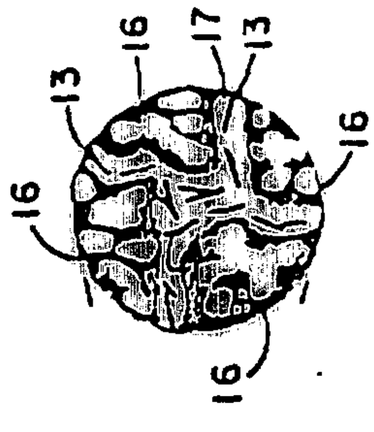

FIG. 3B

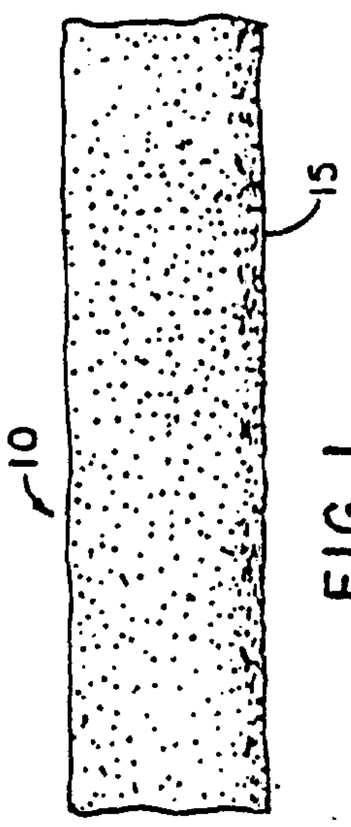

FIG. 1

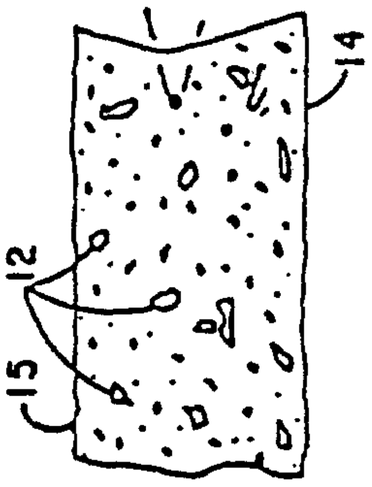

FIG. 3A

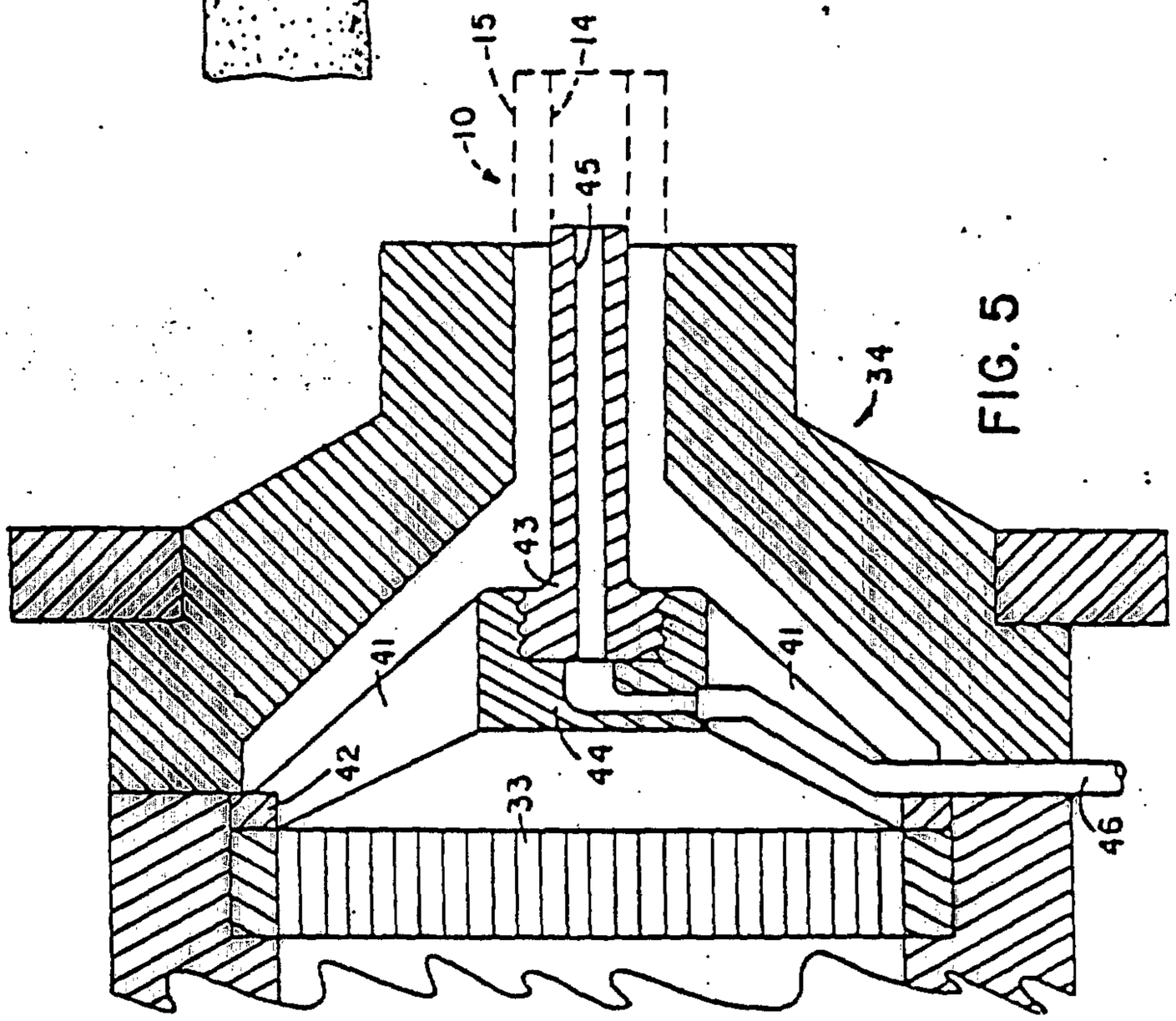

FIG. 5

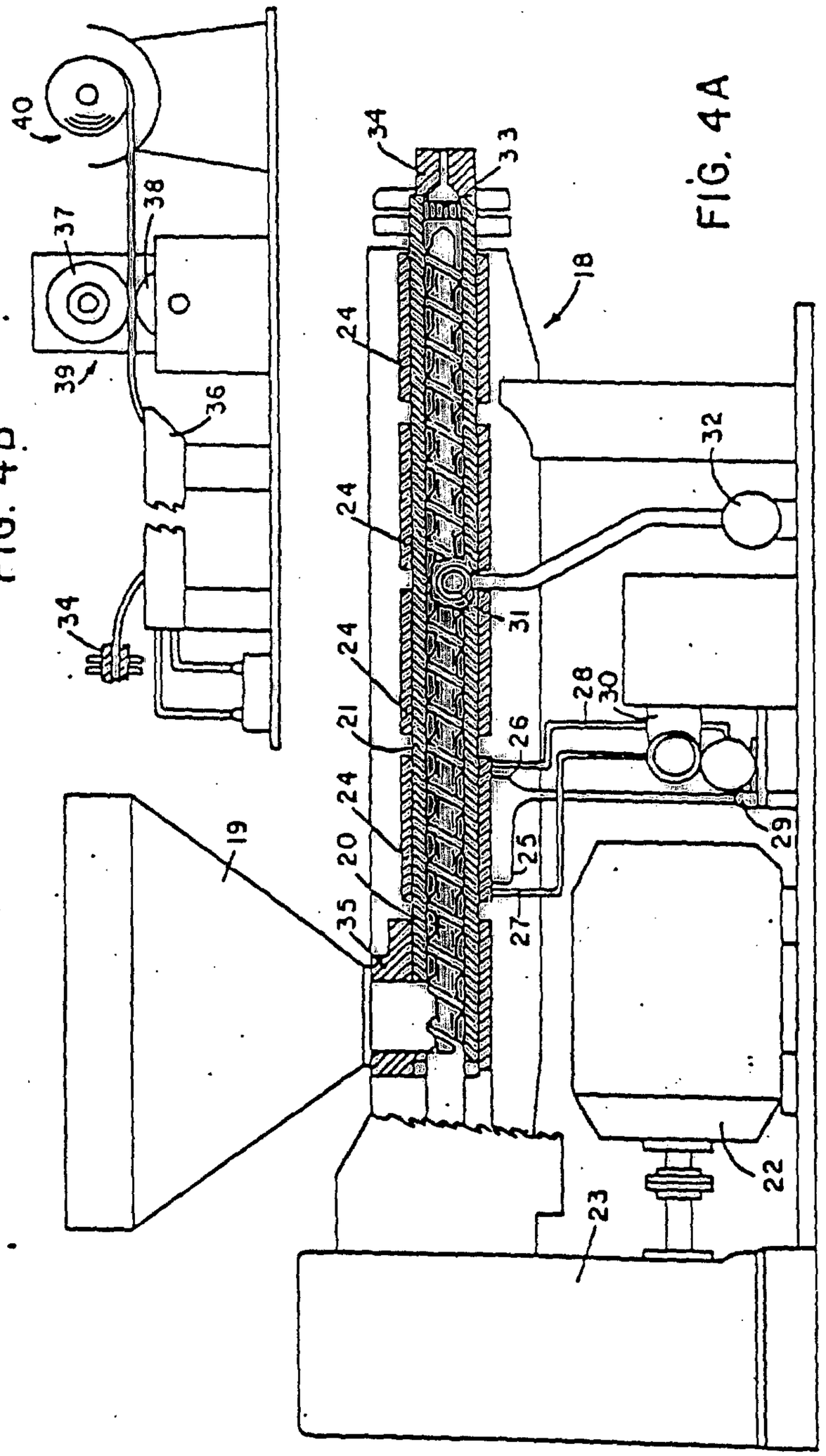

FIG. 4B

FIG. 4A

UNDERGROUND IRRIGATION POROUS PIPE

This invention relates in general to irrigation systems and, in particular, to an irrigation porous pipe processed primarily of reclaimed material from rubber tires, ground to small granular size, mixed with a binder, mainly of polyethylene, with walling sized to withstand soil loading in an underground irrigation environment.

For healthy plant growth and optimized crop production, and with turf grasses, it is water in the root zone area of the soil that counts. With above-ground watering, the water must enter the soil and penetrate to the root zone if it is to benefit the growing plants. Moisture that wets only the above-ground portions of grass plains and the layers of organic material and soil above the root is of particularly no value, and may be harmful with mineral salt crustation build-up through evaporation depositions of mineral content at the surface. A dense sod, for example, may absorb a quarter-inch or more of water before any of it enters the soil. Light, above-ground waterings encourage shallow rooting, thus producing plants that are subject to quickly drying out during intervals of no watering. Water lost through evaporation and run-off, with above-ground surface watering systems is a significant adverse factor in water shortage areas where the ground water table is relatively deep, and water pumping is required, and where water must be supplied over great distances. Above-ground watering encounters timing problems in that moist foliage overnight encourages plant diseases. Further, most golf courses are closed down at least one day a week, with above-ground watering generally presently used, being in many instances high pressure sprinkling systems. Another consideration in the production of a new product is the availability of raw material in this day of shortages, and if it can be made primarily of reclaimed rubber, and/or synthetic rubber, from used tires that present a severse disposal problem, so much the better. Many sprinkling systems have continuing labor and maintenance costs, with requirements such as moving sprinklers, walking the line, pop up or protruding sprinkler heads that many times are struck and damaged or broken off by mowers or other equipment. Further, freeze-up of pipes and other water carrying equipment is a problem, and with severe cold waves, many times causes costly damage. Another consideration is that of interference with normal yard work, with, for example, a porous pipe water distribution system with leaky pipe buried at an underground depth of ten inches or more, allowing all normal yard work, including roto-tilling. It is also important that nutrients and health-giving ingredients, some insecticides and, in some instances, herbicides, be distributed directly to the subsurface root zone in the soil of areas being irrigated. Growth of weeds should be minimized rather than enhanced, and cultivation requirements with cash crops optimally minimized.

Underground irrigation, to many, falls under the general category of drip irrigation used, in any event, in the daily maintenance of an adequate section of the root zones of plants with moisture somewhere between dampness and saturation or field capacity throughout the growing season. This system enables the attainment of an optimized soil-water-plant relationship that is conducive to much better growth and substantially better yields, with less water applied. Evaporation is

substantially totally eliminated, pipes are out of the way of people and machinery, and water, along with fertilizer when used, is applied where it obviously does the most good, right at the roots. Water seeps from the underground pipe, and by capillary action and absorption spreads through the root system, maintaining a constant moisture level throughout the area of treatment.

Variation in the water level content in soil can create many problems, with, for example, expansion and contraction of soil under and around slab foundations. This can be such as to cause foundations to shift around and/or cracking of the foundations, brick walls, inside plaster, and sheetrock walls in homes. Thus, an underground system for maintaining a stabilized soil moisture state would go far in eliminating such disasterous home and building damage. Aeration is important in sewage treatment systems, with air pumped into and bubbled upward through affluent in anaerobic action fluid treatment ponds and tanks, however, in most instances, attainment of desired bubble size is a problem. Most pumped-in, formed air bubbles, in many installations, are too large and gravitate to the surface much too rapidly, so any system that would create small bubbles such as would very slowly drift upward through an affluent mix, is highly desired.

It is therefore a principal object of this invention to provide an underground irrigation system capable of efficiently supplying water and fertilizers to the root zone of plants, without soil structure damage.

Another object with such an underground irrigation system is to minimize water requirements, to minimize evaporation loss to the air, and to avoid mineral salt build-up in the soil.

A further object is to attain a steady, slow-weeping application of water, feeding a capilary absorption distribution action through soil through needed periods of water irrigation.

Still another object is the attainment of stabilized soil conditions under and around building foundations and other structures such as swimming pools.

Features of this invention useful in accomplishing the above objects include, in an underground irrigation porous pipe, a pipe made primarily of ground-up reclaimed rubber and/or synthetic rubber, such as obtained from old tires. The reclaimed rubber granuals, that are ground to a size such as would pass through a 30-mesh screen, are process-mixed through a pipe extruder, with a much smaller amount of binder ingredients that typically include: a binder mix of primarily polyethylene, along with vinyl ABS binder, and a trace of attaclay. The transverse cross-sectional area of the pipe walls is substantial, in relation to the cross-sectional area of the pipe opening, and is thick enough to have labyrinth passageways for seeping of water to the exterior of the pipe without soil-damaging water jets. The pipe is a subsurface irrigation buried pipe having high structural integrity effectively resisting soil-loading pipe collapse, while also having a high degree of flexibility along its length. The pipe is formed in the process through the extruder, with limited foaming from steam originating from absorbed moisture in the ground, reclaimed rubber tire material, and from residual gasses venting from the material mix, with product mix heating in the extruder, forming some open-cell fluid flow paths. Labyrinth passageways between rubber tire granular material and polyethylene binder mix, and through the binder mix, are also formed with the

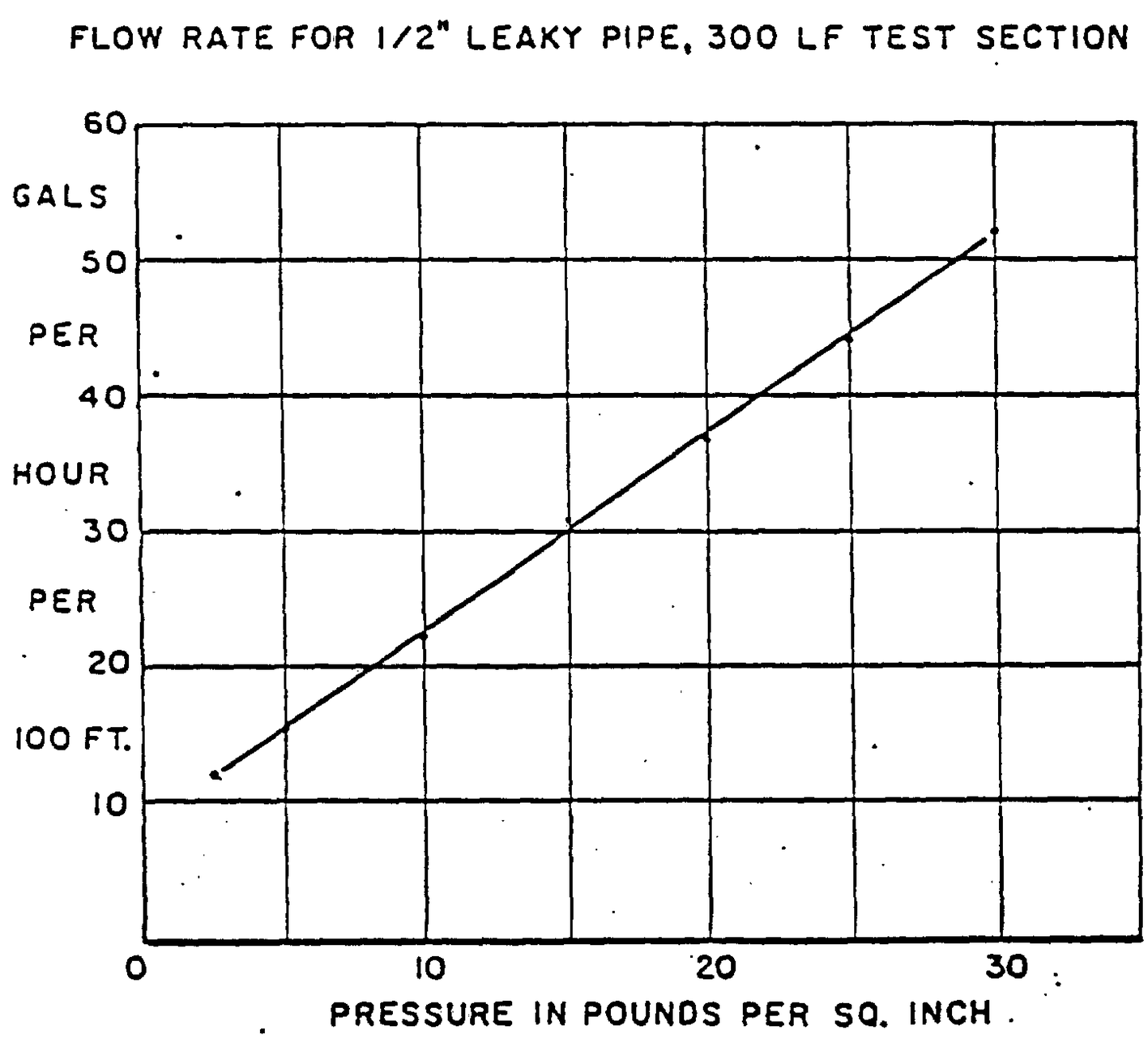

FIG. 6

steam and gas foaming, or blowing, as the pipe is extrusion process formed.

A specific embodiment representing what is presently regarded as the best made of carrying out the invention is illustrated in the accompanying drawings.

In the drawings:

FIG. 1 represents a partial side elevation view of applicant's underground irrigation porous pipe;

FIG. 2, an end view of the pipe of FIG. 1;

FIG. 3A, an enlarged section of pipe walls taken along line 3 — 3 of FIG. 2;

FIG. 3B, a further enlargement of a small portion of the pipe wall section of FIG. 3A;

FIG. 4A, a partially cut away and sectioned view of a vented and temperature regulated screw type extruder used in producing the porous pipe;

FIG. 4B, a partial side elevation view of a long, extended, cold water tank (or trough) receiving hot pipe from the extruder die, a pipe puller, and a pipe coiler;

FIG. 5, a partially cut away and sectioned view of the extruder die tip end; and,

FIG. 6, a gallons-per-hour per 100ft. flow rate to pressure graph for a 300ft. long section of ½ in. I.D. leaky pipe.

Referring to the drawings:

The porous pipe 10 with a short length, shown in FIG. 1, and in end view in FIG. 2, is made primarily of reclaimed rubber-like, previously vulcanized material such as that recovered from chopped-up old rubber tires with the metal removed. This rubber-like, previously vulcanized material is reground to generally less than one-sixteenth inch diameter granual size, even down to a size that passes through a 30-mesh screen, before being process mixed with binder material, forming a matrix interlocking the rubber-like granuals in the processed pipe 10. While the wall 11 thickness to pipe I.D. is such, with the pipe material compounded for the finished pipe, to give good structural integrity against soil loading collapse when buried in the soil as an underground irrigation water seeping pipe, it has a high degree of flexibility along its length in adjusting to required bends and turns necessary for underground installations. Foaming or blowing during product mix processing to the finished pipe 10 forms random pockets 12 (or voids) in the pipe wall 11, such as shown in more detail in the wall section enlargement of FIG. 3A where passageways to the exterior are not formed, or are late in forming with the blowing process action. Irregularly shaped labyrinth type channels 13 (shown in the further enlargement of FIG. 3B, an enlargement in the order of approximately 120X), formed in the blowing process action are an essential feature of the finished porous pipe product. Enough blow process formed channels 13 are formed, interconnecting the inner surface 14 and outer surface 15 of the pipe 10, either individually or via interconnected channels 13, to provide the desired through-the-wall seepage passageways. While the blowing formed pockets 12 are not the desired result, some of them do interconnect with some blowing process formed channels 13, as part of some of the through-the-wall seepage passageways. The desired blowing process is provided primarily with steam from moisture previously absorbed by the previously vulcanized material granuals 16, and some residual gases in the granuals and/or binder material used in making pipe 10, with most blowing process formed labyrinth type channels 13 being developed in and though the interconnecting matrices 17 formed by the binder material interlocking the granulas 16 into the product pipe 10. With processing of the pipe, while the granuals 16 generally retain their physical integrity, there is some degree of surface material welding or merging with the binder material.

Porous pipe 10 is extruded from a two stage wave screw extruder 18, such as shown in FIG. 4A, with the ingredient mix fed from hopper 19 to the product mix drive wave screw 20 contained within and extending through substantially the entire length of the relatively long extruder cylinder 21. Extruder 18 is generally typical of screw type extruders available in both this country and abroad, equipped with a drive motor 22, a gear drive train section 23 output driving the wave screw 20. The extruder 18 is also equipped with a plurality of heating and cooling cylinder barrels 24 longitudinally positioned along the length of extruder cylinder 21, with each having cast-in resistance elements connected through wires 25 and 26, and cast-in cooling coils connected through cooling fluid lines 27 and 28 to electrical power source control 29 and cooling fluid source control 30, such as shown with only one of the cylinder barrels 24, as a matter of convenience. A vent 31, connected to a vacuum control 32, is positioned at any convenient location along the extruder cylinder 21 and wave screw 20, longitudinally, after the product mix temperature has risen, through heating control and product mix working, that blow venting can occur through the binder material content of the product mix. The other vent 31 position constraint is that it must be positioned far enough ahead of pressure head screen 33 that there is not as yet a reflected back pressure build up at that location along the wave screw 20. The product mix, forced through pressure head screen 33, is extruded from the extruder die 34 where effective blowing creation of irregularly shaped labyrinth type channels 13 occurs with lowering of product material pressure from the high pressures at pressure head screen 33 down to atmospheric pressure. The feed throat member 35 below hopper 19 may be equipped with cooling and/or heating structure to further aid in temperature control of the product mix and extension of the possible positioning range of vent 31 toward the hopper 19.

Porous pipe 10 being extruded from the extruder die 34 very quickly enters, as shown in FIG. 4B, a cooling traugh 36, approximately 40 feet long, filled with chilled water, at approximately 35° F. This quickly congeals the pipe binder matrices, with the blowing generated through wall passageways desired in the finished product. The pipe 10 is drawn from the cooling traugh 36 by rubber tired, wheels 37 and 38 puller assembly 39 and passed to a conventional reel pipe coiler 40.

Referring also to the enlarged extruder die 34 tip end of the extruder 18 product mix forced through pressure head screen 33 flows by thin vains 41 extended from mount ring 42 as supports for porous pipe I.D. die mandrel 43 and mandrel base 44 into which the I.D. die mandrel 43 is threaded. A center opening 45 in I.D. mandrel 43 is connected through passage 46 in base 44 and pipe 46 to the exterior venting of the interior of pipe being die extruded to atmosphere as it first comes from the die.

Excellent product production runs are obtained, for example, with prevulcanized material granulas ground from old rubber tires with metal removed but soft cording remnants remaining in a granular size consistency

that would pass through a 30 mesh screen. These pre-vulcanized material granuals, as approximately 70% of the product mix, are mixed with the remaining 30% of the product mix in the hopper 19 of extruder 18. This is with the 30% of the product mix comprised of, by percentages:

Polyethylene (high density)	70%
Vinyl	14%
ABS (Binder)	15%
Attaclay	1%

The product mix is fed from the hopper 19 into the input end of the extruder cylinder 21 to product mix drive screw 20, where heat input and heat of working initially brings the product mix temperature up to approximately 300° F. Next, down the screw drive in the direction of material flow, before, and as the product mix approaches vent 31, the product mix temperature is raised to approximately 350° F, generally in the range of 350° to 400° F, and then with venting and immediately thereafter the product mix is cooled down to approximately 300° F. Then the product mix is heated up again to approximately 350° F as the product mix is approaching the pressure head screen 33, along with a pressure build up to the approximate range of 2000 to 3500 p.s.i. at the screw 20 drive pressure side of the pressure head screen 33. The process temperatures used are generally high enough to transform the binder material content of the product mix to the moulten fluid plastic state such that flow venting can occur there through while the pre-vulcanized material granulas generally retain their integrity, other than for some degree of surface welding or merging with the binder material in the interconnecting matrices 17. The porous pipe 10 is screw-pushed out through the extruder die 34 into cooling traugh 36 from which it is pulled and then rolled. Venting to a vacuum of 20 inches of mercury at vent 31 gives a product standard pipe with a seepage flow rate of 15 gallons per 100 feet per hour at five p.s.i. internal water pressure, as shown in FIG. 6, with the effective blow venting seepage passage action occurring as the pipe 10 is being extruded to the atmosphere. Venting to a five inch mercury vacuum with approximately the same product process temperatures results in the hightest leak pipe rate of 40 gallons per 100 feet per hour at 5 pounds p.s.i. water pressure. Further, venting to 25 inches of mercury vacuum results in the lowest leak pipe, with 12 gallons per 100 feet per hour at 5 pounds p.s.i. water pressure. The venting provided at vent 31 is quite effective at the product mix temperature at that process location at stabilizing the residual moisture and gas content in the product mix for good uniform blowing action control as pipe 10 is extruded to atmosphere from the die end 34.

The product mix may be varied with the pre-vulcanized material granuals being in the range of approximately 60 to 90 per cent of the product mix, and the binder material being in the corresponding related range of approximately 40 to 10 per cent of the product mix. Further, the binder material may be the mix previously outlined, or any one or two of the materials including polyethylene, vinyl, ABS (binder) with a trace of attaclay, or without, as may be used for product variation results as desired. In any event, the binder substance (whether of one or more ingredients) is transformed to the plastic or moulten state at the process temperatures used, and with mixing action within the screw extruder while the previously vulcanized material granuals generally retain their structural integrity.

Whereas the invention is herein illustrated and described primarily with respect to several embodiments hereof, it should be realized that various changes may be made without departing from essential contributions to the art made by the teachings hereof.

I claim:

1. Irrigation conduit means comprising:

a substantially flexible tubular member formed of a plurality of random sized, random shaped, and random spaced, elastomer bodies, and

a polyethylene binder mix intermixed with said bodies to provide a porous sidewall having a labyrinthine network of irregularly shaped and sized channel-like apertures closely spaced at random along its length and about its circumference.

2. Irrigation conduit means according to claim 1 wherein said tubular member is formed of granulated elastomer bodies to provide said channel-like apertures.

3. Irrigation conduit means according to claim 2 wherein at least a substantial portion of said elastomer is a reclaimed rubber material.

4. Irrigation conduit means according to claim 3 wherein said reclaimed rubber material is discarded automobile wheel casings.

5. Irrigation conduit means according to claim 4 wherein said rubber material is in the form of granules having generally a diameter less than one-sixteenth inch.

6. Irrigation conduit means comprising:

a substantially flexible tubular member formed of a plurality of random sized, random shaped, and random spaced elastomer bodies,

said elastomer bodies being granulated reclaimed rubber of discarded automobile wheel casings and having generally a diameter less than one-sixteenth inch,

a binder interconnecting said bodies to provide a porous sidewall having a labyrinthine network of irregularly shaped and sized channel-like apertures closely spaced at random along its length and about its circumference,

said binder being present in the range of 10% to 40% by weight and being composed of a mixture of polyethylene, vinyl, ABS binder, and attaclay.

7. Irrigation conduit means according to claim 6 wherein said labyrinthine apertures are sized to provide a pipe leak rate of between 12 to 20 gallons of water per one-hundred feet per hour at an internal water pressure of between 5 to 10 pounds per square inch.

* * * * *

UNITED STATES PATENT OFFICE
CERTIFICATE OF CORRECTION

Patent No. 4,003,408 Dated January 18, 1977

Inventor(s) James E. Turner

It is certified that error appears in the above-identified patent and that said Letters ~~Patent are~~ hereby corrected as shown below:

Column 3, line 4,	"made" should read --mode--.
Column 4, line 12,	insert --commercially-- between "extruders" and "available".
Column 4, line 47,	"traugh" should be spelled --trough--.
Column 4, line 52,	"traugh" should be spelled --trough--.
Column 4, line 62,	insert --for-- between "exterior" and "venting".
Column 4, line 66,	"granulas" should be spelled --granuals--.
Column 5, line 33,34	"granulas" should be spelled --granuals--.
Column 5, line 38,	"traugh" should be spelled --trough--.

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[redacted]

UNITED STATES PATENT OFFICE

CERTIFICATE OF CORRECTION

Patent No. 4,003,408 Dated January 18, 1977

Inventor(s) James E. Turner

It is certified that error appears in the above-identified patent and that said Letters Patent are hereby corrected as shown below:

Column 6, line 7, "moulten" should be spelled --molten--.

Column 6, line 12, change "the" to --this--.

Column 6, line 15, "essectial" should be spelled --essential--.

Signed and Sealed this

Twenty-fourth Day of May 1977

[SEAL]

Attest:

RUTH C. MASON
Attesting Officer

C. MARSHALL DANN
Commissioner of Patents and Trademarks

United States Patent [19]

Turner

[11] 4,028,288

[45] June 7, 1977

[54] MOLDABLE END PRODUCTS FROM PRIMARILY RECLAIMABLE WASTE MATERIALS

[75] Inventor: James E. Turner, Southlake, Tex.

[73] Assignee: Tire Recyclers International, Inc., Southlake, Tex.

[22] Filed: Feb. 3, 1976

[21] Appl. No.: 654,959

[52] U.S. Cl. ..... 260/2.3; 260/2.5 HA; 260/2.5 HB; 260/4 R; 260/889; 260/892; 260/888; 264/109; 428/407

[51] Int. Cl.² B29H 19/00; B32B 5/00

[58] Field of Search ..... 260/2.3, 3, 4 R, 4 AR, 260/5, 2.5 AK, 2.5 HA, 2.5 HB, 889, 892, 888; 264/122, 109, 126; 428/2, 68, 74, 76, 143, 218, 316, 317, 321, 322, 323, 147, 327, 402, 407, 409

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Primary Examiner—William J. Van Balen
Attorney, Agent, or Firm—Warren H. Kintzinger

[57] ABSTRACT

A heat and pressure moldable material end product made from injection or extrusion molding processes using a mixture of reclaimed pre-vulcanized rubber bits and resinous thermoplastic material bits as raw material. The reset end product is a homogeneously incomplete mixture of the raw material, including reset resin and rubber mixture portions and rubber bits per se in a bonded inter-relationship. The porosity of the end product is controllable by the relative amount and size of rubber particles in the raw material mixture.

7 Claims, No Drawings

EXHIBIT B

MOLDABLE END PRODUCTS FROM PRIMARILY RECLAIMABLE WASTE MATERIALS

This invention relates in general to new compositions of matter, and in particular, to a new raw material composed of reclaimed waste which is useful in making heat and pressure molded end products.

More specifically, the invention relates to end products fashioned by heat and pressure molding techniques, using scrap rubber tire material bits and waste polymer and copolymer material bits sized and proportioned to be useful for making the molded end product in the same general way and under the same general temperature settings and general conditions as if the product were made with plastic material alone.

The accumulation of old tires and waste resin products and containers has long presented an ecological problem with the non-biodegradable characteristic of such waste. Land fill area is rapidly disappearing, and many areas prohibit the burying of this type of waste, as well as the burning thereof.

Accordingly, an object of this invention is the provision for reclaiming waste rubber and scrap plastic resins for use in making molded end products.

Another object of the invention is the use of waste rubber and plastic resins in making molded end products having improved characteristics of resilience and toughness as compared to similar end products molded from rubber or plastic materials alone.

A further object of the invention is the provision of a material composition comprised of a mixture of particalized rubber tires and plastic resin waste material, with material bits sized and proportioned in the mixture to permit heat and pressure molding of an end product therefrom with a controllable degree of porosity.

Features of the invention, useful in accomplishing the above objects include, in a material useful for heat and pressure molding of end products, a raw material mixture comprising particalized pre-vulcanized rubber material, including the fibrous cord content thereof, and a lesser amount of particalized plastic resin material. The degree of porosity of the reset end product is controllable by and generally proportioned to, the size of the rubber material bits and the relative amount thereof utilized in the material mixture.

Efforts have been made to combine reclaimed old tires with asphalt and polyethylene to make improved road and play area surfaces (Johnson, U.S. Pat. No. 3,338,849). In Bollman, U.S. Pat. No. 2,041,223, sulphur is added to arrive at an adhesive or coating composition for use on rubber shoes and other uses. In Popham, U.S. Pat. No. 2,392,691, rubber and/or reclaimed rubber is added to phenol, with the resin used directly as a bonding agent, or with the materials ground into a powder form with fillers and a hardening agent as a moulding composition. In Leydon, U.S. Pat. No. 2,593,681, plastics, synthetic rubber and rubber are combined with solvents to form a liquid useful as a coating. Dillhoefer, U.S. Pat. No. 3,386,925 teaches blends of reclaimed rubbers and plastics which can be fabricated by extrusion and injection molding techniques.

I have found that a new and useful end product may be molded from particalized bits of reclaimed rubber tires and resinous plastic waste, by so selecting material bit sizes and relative proportions thereof in a raw mat[illegible] heat and pressure [illegible]

techniques may form the material mix into a reset end product which, in body section, comprises a homogeneously incomplete, reset mixture of the raw material mix, including portions of rubber-like material bits per se and portions of a reset melt of rubber bits and plastic bits, in a bonded relationship. The porosity of the end product, as might be desired and or imperative, in, for example, a minnow pail or a nursery pot container, is variable in proportion to the size of the rubber material bits and the relative amount, by weight, of these bits in the molding material mixture.

In a preferred embodiment, the mixture of the present invention comprises, by weight, a mixture of between 50% and 80% of particalized pre-vulcanized rubber-like material with particalized scrap plastic material such as various polymers, copolymers, or fiberglass. The rubber-like material may preferably comprise particalized tires, including the fibrous cord content thereof (generally not exceeding ten percent of the particalized tire material), and excluding the metallic content thereof.

For purposes of the invention, the term "particalized rubber tires" or pre-vulcanized rubber material which forms one portion of the material mixture is intended to mean one of the following materials: natural rubber, polymers, interpolymers and copolymers of conjugated diolefins, i.e., polybutadiene, butadiene-styrene copolymers, butadiene-acrylonitrile copolymers, polymers and copolymers of methylpentadiene; polymeric forms of chlorine substitution products of conjugated diolefins, i.e., polychloroprene; polymers of non-conjugated systems, i.e., polyisobutylene and copolymers of isobutylene and isoprene; and condensation polymers of the polysulphide type.

If the two materials in the mix are to be blended cold, the chosen kind of waste plastic is refined so that its particle size is approximately the size of the rubber particles with which it is mixed. If a Banbury mixer, or other type of hot mixer-blender, is used, the relative size of the particles is of less significance.

The porosity of the molded end product, using the above-defined material mixture in a heat and pressure molding process, is established in general by the relative amount of rubber material bits in the mix, as well as the size thereof. For example, a 50-50 rubber-plastic mixture results in an end product with very little porosity. An 80-20 rubber-plastic mixture results in a very porous end product. For purposes of the invention, rubber material particles from 30 mesh size up to ¾ inch screen mesh size can be used. When using particalized rubber tires as the rubber-like ingredient in the mixture, all of the rubber tire that passes through the screen is used except the metal, which would be magnetically separated.

Because of the insulating qualities of the rubber particles used and the potentially high porosity of the rubber particles (which again makes it very insulative), the mold used for forming the end product may be modified from, for example, the same mold used for molding plastic-only materials. Generally, a larger gate opening and travel paths for the resin or feedstock to flow throughout the mold are needed. Because of the increase of substance in the rubber-plastic mixture, more flow paths may be created to assure material flow from one end of the mold to the other. Pressure would nor[illegible]ly be increased from that used in [illegible]

tions to state of the art molding technology as it applies to various and sundry plastics and fiberglass.

The resulting end product, using the mixture described herein has improved properties of resiliency, toughness, weight, and porosity as compared to molded plastic products.

By control of heat, cooking time, pressure and other molding process parameters, the end product may exhibit a selected degree of porosity and weight in comprising a reset, incompletely homogeneous, mixture of melted plastic-rubber blend bonded to rubber bits per se, and including gas formed material voids therein. The resulting end products, including garbage cans, nursery pots, buckets, fence posts, and railroad cross ties, in being made from such reclaimed waste materials, are obviously less expensive than currently used counterparts, while exhibiting, in many usages, improved strength, weight, resilience, and porosity characterisucs.

Whereas this invention is herein described with respect to a preferred embodiment, it should be realized that various changes may be made without departing from essential contributions to the art made by the teachings hereof.

I claim:

1. A heat and pressure molded end product comprising a mixture of particalized rubber tires including the fibrous cord content thereof and a lesser amount of synthetic resin thermoplastic material bits, said end

product comprising a substantially homogeneously incomplete reset mixture, including portions of a reset mixture of melted synthetic thermoplastic resin and rubber tire particles, and portions of said rubber tire particles, per se, in a bonded relationship, the porosity of said end product being substantially proportional to the ratio of said rubber tire particles to said synthetic thermoplastic resin material bits in said mixture.

2. The product of claim 1 with said synthetic thermoplastic resin material comprising particalized scrap including at least one of the materials polyethylene, styrene, and polypropylene.

3. The product of claim 1, with said synthetic thermoplastic resin material comprising fiberglass.

4. The product of claim 2, with said end product comprising, in material cross section, a plurality of gas-formed material voids between substantially contiguous wall surfaces.

5. The product of claim 4, with said particalized rubber tire material comprising, by weight, not less than 50 percent and not more than 80 percent of said mixture.

6. The product of claim 5, with said particalized rubber tire material comprising material bits sized between 30 mesh and ⅜ inch screen mesh.

7. The product of claim 6, with the fibrous content of said particalized rubber tires comprising less than 10 percent of said mixture by weight.

* * * * *

[11] 4,110,420
[45] Aug. 29, 1978

[54] METHOD FOR MAKING POROUS PIPE FROM RUBBER TIRE

[75] Inventor: James E. Turner, Southlake, Tex.

[73] Assignee: Cry Baby, Inc., Houston, Tex.

[21] Appl. No.: 699,885

[22] Filed: Jun. 25, 1976

Related U.S. Application Data

[62] Division of Ser. No. 445,866, Feb. 26, 1974, Pat. No. 4,003,408.

[51] Int. Cl.² B29D 27/00; B29H 1/10

[52] U.S. Cl. 264/41; 61/12; 521/84; 521/140; 264/45.3; 264/53; 264/68; 264/DIG. 5; 264/101; 264/209; 264/DIG. 13; 264/DIG. 69

[58] Field of Search ..... 264/41, 53, 122, 123, 264/109, DIG. 69, 45.3, 53, 68, 101, 209, DIG. 5, DIG. 13, DIG. 69; 47/48.5; 61/12, 13; 239/145; 138/111, 118; 260/2.5 B

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Primary Examiner—Philip Anderson
Attorney, Agent, or Firm—Bard and Groves

[57] ABSTRACT

A porous pipe primarily of rubber and synthetic rubber reclaimed from rubber tires, ground to a relatively small granular size, with metal removed; such as, for example, would pass through a 30-mesh screen, process-mixed through a pipe extruder, with a much smaller binder mix of primarily polyethylene, along with vinyl, ABS binder, and a trace of attaclay. The resulting product is useful as a subsurface irrigation buried pipe, having high structural integrity effectively resisting soil-loading pipe collapse, and it even resists collapse from moderately large rocks in the soil, and yet has a high degree of flexibility along its length. A pipe is provided with cross sectional area of pipe wall more than twice the cross sectional area of the pipe opening. It is a waterleaking pipe formed in the process through the extruder with limited foaming from steam originating from absorbed moisture in the ground, reclaimed rubber tire material, and from residual gasses venting from the material mix, with product mix heating in the extruder, forming some open cell fluid flow paths. The foaming with steam and gasses from the mix also form labyrinth passageways between the rubber tire granuals and the polyethylene binder mix, and also through the binder mix that is non-compatible with the rubber granules but that forms a physical interconnective structural material binder therefor.

3 Claims, 8 Drawing Figures

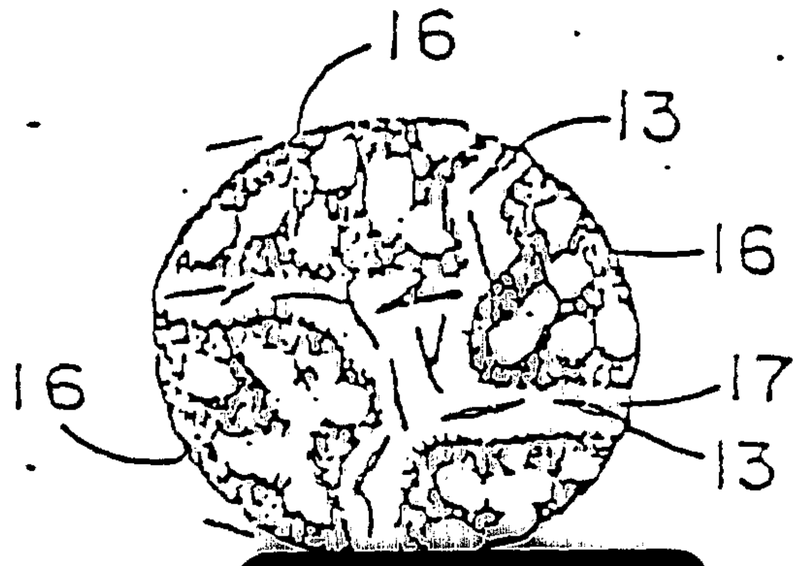

EXHIBIT C

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FIG. 5

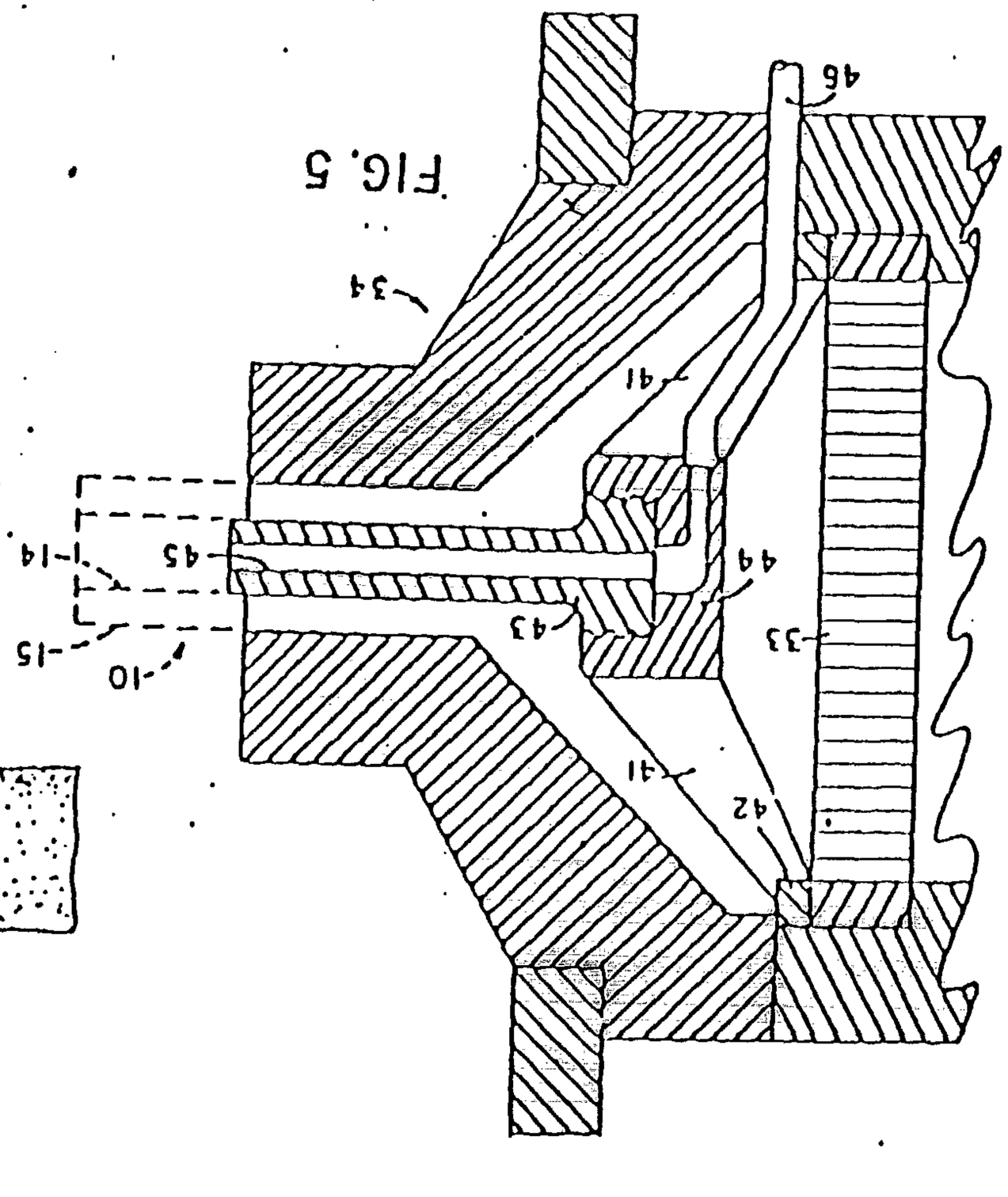


FIG. 3A

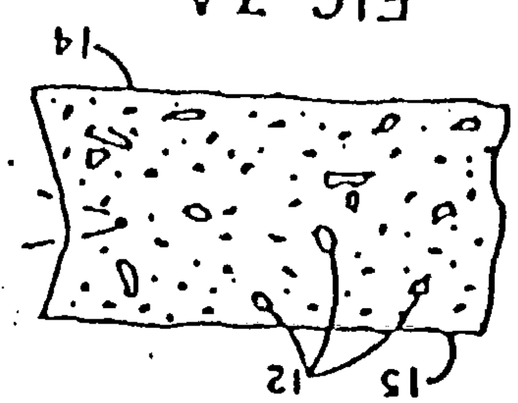


FIG. 3B

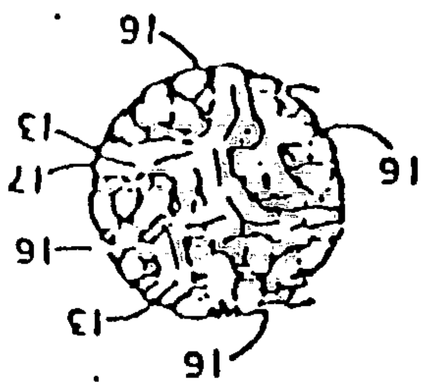


FIG. 1

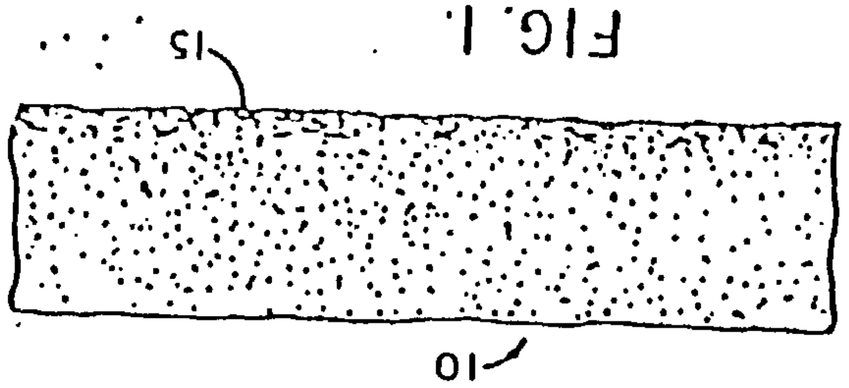
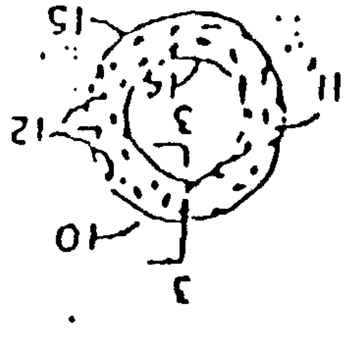


FIG. 2



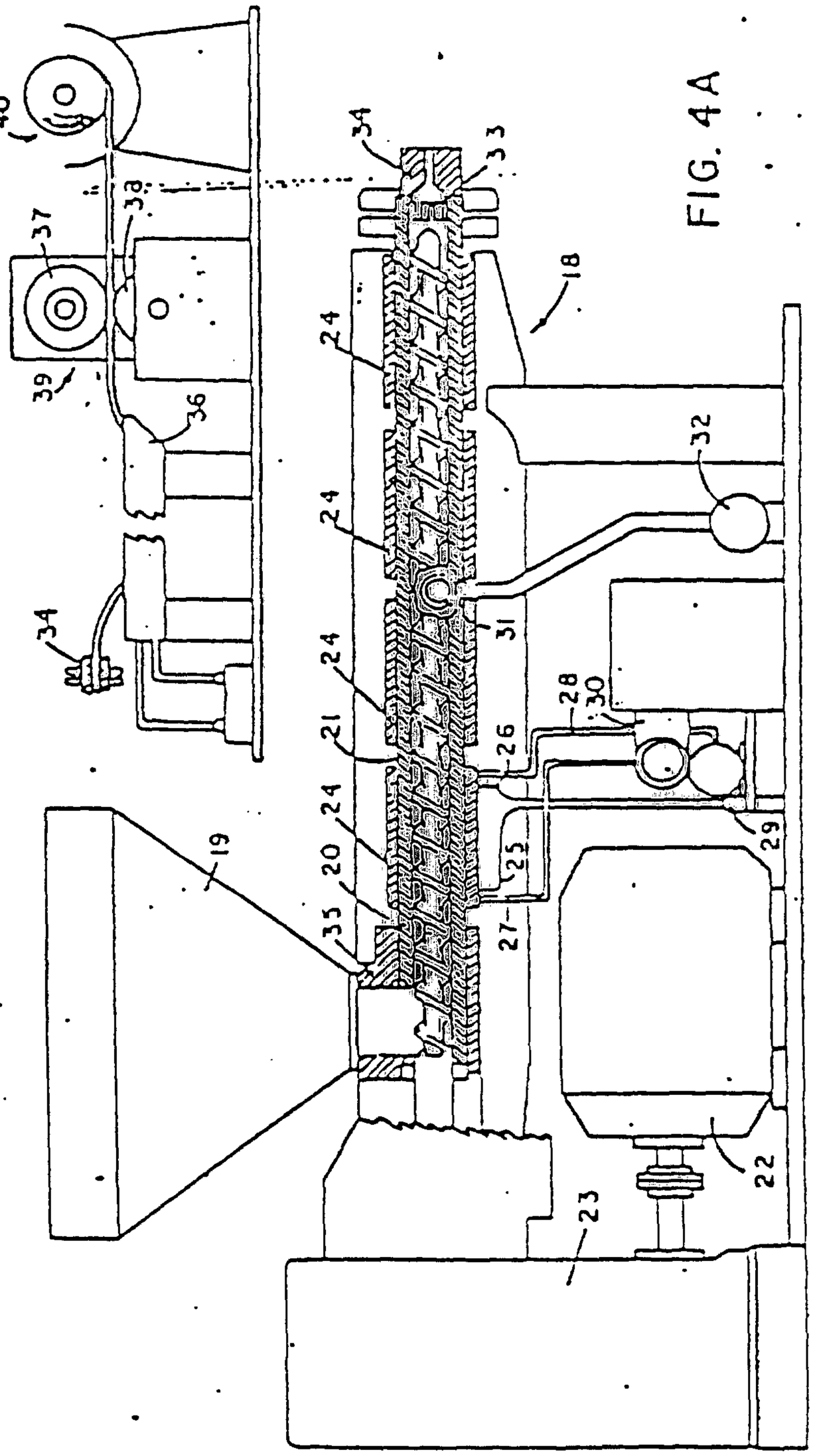


FIG. 4B

FIG. 4A

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[redacted]

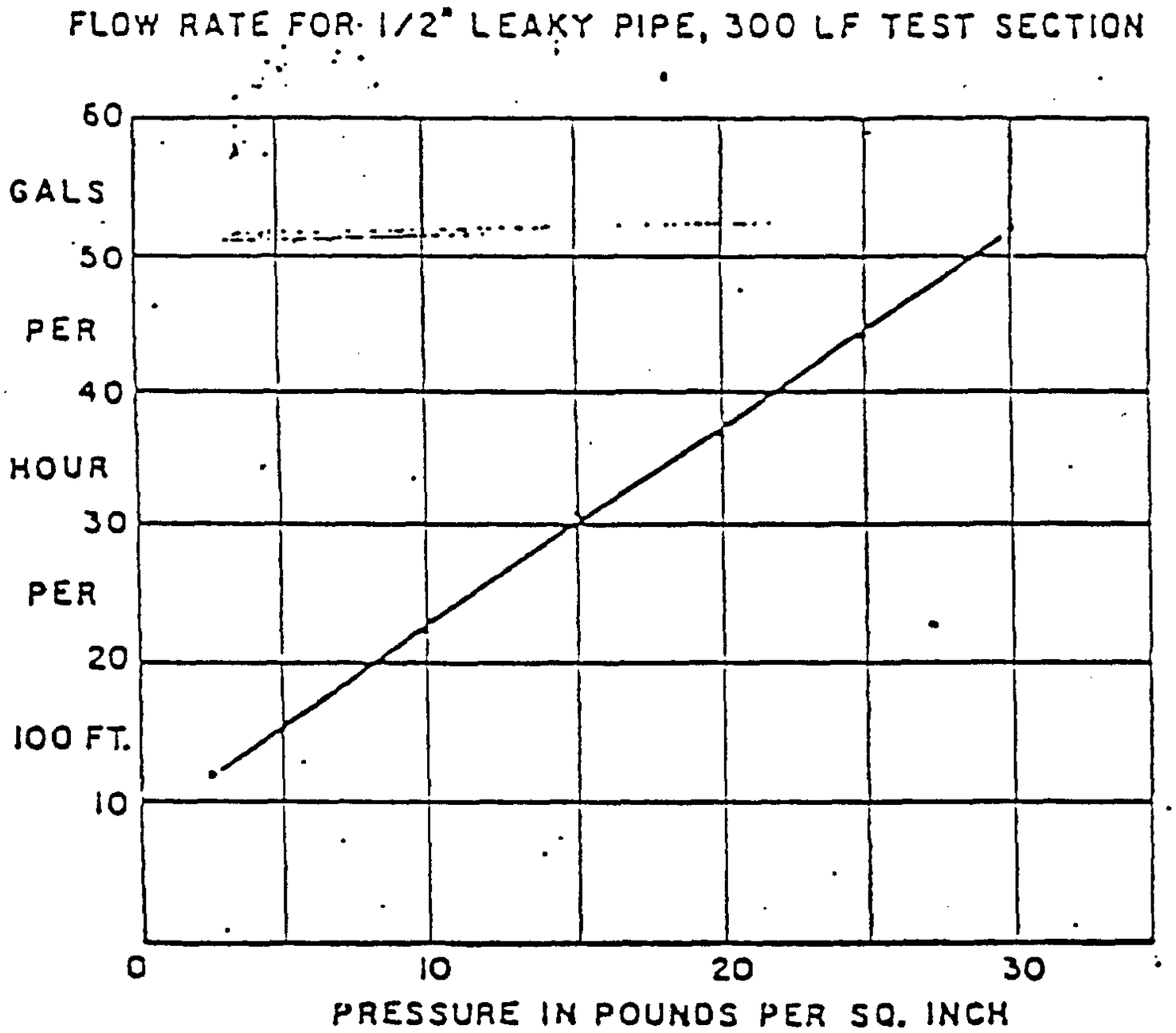

FIG. 6

[illegible] UNDERGROUND POROUS PIPE

This [illegible] Application Ser. No. 44[illegible], filed Feb. 26, 1974 now U.S. Pat. No. 4,003,208.

This invention relates in general to the manufacture of irrigation systems and, in particular, to an irrigation porous pipe processed primarily of reclaimed material from rubber tires, ground to small granular size, mixed with a binder, mainly of polyethylene, with walling sized to withstand soil loading in an underground irrigation environment.

For healthy plant growth and optimized crop production, and with turf grasses, it is water in the root zone area of the soil that counts. With above-ground watering, the water must enter the soil and penetrate to the root zone if it is to benefit the growing plants. Moisture that wets only the above-ground portions of grass plants and the layers of organic material and soil above the root is of particularly no value, and may be harmful with mineral salt crustation build-up through evaporation depositions of mineral content at the surface. A dense sod, for example, may absorb a quarter-inch or more of water before any of it enters the soil. Light, above-ground waterings encourage shallow rooting, thus producing plants that are subject to quickly drying out during intervals of no watering. Water lost through evaporation and run-off, with above-ground surface watering systems is a significant adverse factor in water shortage areas where the ground water table is relatively deep, and water pumping is required, and where water must be supplied over great distances. Above-ground watering encounters timing problems in that moist foliage overnight encourages plant diseases. Further, most golf courses are closed down at least one day a week, with above-ground watering generally presently used, being in many instances high pressure sprinkling systems. Another consideration in the production of a new product is the availability of raw material in this day of shortages, and if it can be made primarily of reclaimed rubber, and/or synthetic rubber, from used tires that present a severe disposal problem, so much the better. Many sprinkling systems have continuing labor and maintenance costs, with requirements such as moving sprinklers, walking the line, pop up or protruding sprinkler heads that many times are struck and damaged or broken off by mowers or other equipment. Further, freeze-up of pipes and other water carrying equipment is a problem, and with severe cold waves, many times causes costly damage. Another consideration is that of interference with normal yard work, with, for example, a porous pipe water distribution system with leaky pipe buried at an underground depth of ten inches or more, allowing all normal yard work, including roto-tilling. It is also important that nutrients and health-giving ingredients, some insecticides and, in some instances, herbicides, be distributed directly to the subsurface root zone in the soil of areas being irrigated. Growth of weeds should be minimized rather than enhanced, and cultivation requirements with cash crops optimally minimized.

Underground irrigation, to many, falls under the general category of drip irrigation-used, in any event, in the daily maintenance of an adequate section of the root zones of plants with moisture somewhere between dampness and saturation or field capacity throughout the growing season. This system enables the attainment of an optimized soil-water-plant relationship that is

conducive to much better growth and substantially better yields, with less water applied. Evaporation is substantially totally eliminated, pipes are out of the way of people and machinery, and water, along with fertilizer when used, is applied where it obviously does the most good, right at the roots. Water seeps from the underground pipe, and by capillary action and absorption spreads through the root system, maintaining a constant moisture level throughout the area of treatment.

Variation in the water level content in soil can create many problems, with, for example, expansion and contraction of soil under and around slab foundations. This can be such as to cause foundations to shift around and/or cracking of the foundations, brick walls, inside plaster, and sheetrock walls in homes. Thus, an underground system for maintaining a stabilized soil moisture state would go far in eliminating such disasterous home and building damage. Aeration is important in sewage treatment systems, with air pumped into and bubbled upward through affluent in anaerobic action fluid treatment ponds and tanks, however, in most instances, attainment of desired bubble size is a problem. Most pumped-in, formed air bubbles, in many installations, are too large and graviate to the surface much too rapidly, so any system that would create small bubbles such as would very slowly drift upward through an affluent mix, is highly desired.

It is therefore a principal object of this invention to provide a method for the manufacture of an underground irrigation system capable of efficiently supplying water and fertilizers to the root zone of plants, without soil structure damage.

Another object with such an underground irrigation system is to minimize water requirements, to minimize evaporation loss to the air, and to avoid mineral salt build-up in the soil.

A further object is to attain a steady, slow-weeping application of water, feeding a capilary absorption distribution action through soil through needed periods of water irrigation.

Still another object is the attainment of stabilized soil conditions under and around building foundations and other structures such as swimming pools.

Features of this invention useful in accomplishing the above objects include, in an underground irrigation porous pipe, a pipe made primarily of ground-up reclaimed rubber and/or synthetic rubber, such as obtained from old tires. The reclaimed rubber granuals, that are ground to a size such as would pass through a 30-mesh screen, are process-mixed through a pipe extruder, with a much smaller amount of binder ingredients that typically includes: a binder mix of primarily polyethylene, along with vinyl, ABS binder, and a trace of attaclay. The transverse cross-sectional area of the pipe walls is substantial, in relation to the cross-sectional area of the pipe opening, and is thick enough to have labyrinth passageways for seeping of water to the exterior of the pipe without soil-damaging water jets. The pipe is a subsurface irrigation buried pipe having high structural integrity effectively resisting soil-loading pipe collapse, while also having a high degree of flexibility along its length. The pipe is formed in the process through the extruder, with limited foaming from steam originating from absorbed moisture in the ground, reclaimed rubber tire material, and from residual gasses venting from the material mix, with product mix heating in the extruder, forming some open-cell fluid flow

[illegible] the pipe is extrusion process [illegible]

[illegible] is illustrated in the accompanying drawings.

In the drawings:

FIG. 1 represents a partial side elevation view of applicant's underground irrigation porous pipe;

FIG. 2, an end view of the pipe of FIG. 1;

FIG. 3A, an enlarged section of pipe walls taken along line 3 — 3 of FIG. 2;

FIG. 3B, a further enlargement of a small portion of the pipe wall section of FIG. 3A;

FIG. 4A, a partially cut away and sectioned view of a vented and temperature regulated screw type extruder used in producing the porous pipe;

FIG. 4B, a partial side elevation view of a long, extended, cold water tank (or trough) receiving hot pipe from the extruder die, a pipe puller, and a pipe coiler;

FIG. 5, a partially cut away and sectioned view of the extruder die tip end; and,

FIG. 6, a gallons-per-hour per 100ft. flow rate to pressure graph for a 300 ft. long section of 1 in. I.D. leaky pipe.

Referring to the drawings:

The porous pipe 10 with a short length, shown in FIG. 1, and in end view in FIG. 2, is made primarily of reclaimed rubber-like, previously vulcanized material such as that recovered from chopped-up old rubber tires with the metal removed. This rubber-like, previously vulcanized material is reground to generally less than one-sixteenth inch diameter granual size, even down to a size that passes through a 30-mesh screen, before being process mixed with binder material, forming a matrix interlocking the rubber-like granuals in the processed pipe 10. While the wall 11 thickness to pipe I.D. is such, with the pipe material compounded for the finished pipe, to give good structural integrity against soil loading collapse when buried in the soil as an underground irrigation water seeping pipe, it has a high degree of flexibility along its length in adjusting to required bends and turns necessary for underground installations. Foaming or blowing during product mix processing to the finished pipe 10 forms random pockets 12 (or voids) in the pipe wall 11, such as shown in more detail in the wall section enlargement of FIG. 3A where passageways to the exterior are not formed, or are late in forming with the blowing process action. Irregularly shaped labyrinth type channels 13 (shown in the further enlargement of FIG. 3B, an enlargement in the order of approximately 120X), formed in the blowing process action are an essential feature of the finished porous pipe product. Enough blow process formed channels 13 are formed, interconnecting the inner surface 14 and outer surface 15 of the pipe 10, either individually or via interconnected channels 13, to provide the desired through-the-wall seepage passageways. While the blowing formed pockets 12 are not the desired result, some of them do interconnect with some blowing process formed channels 13, as part of some of the through-the-wall seepage passageways. The desired blowing process is provided primarily with steam from moisture previously absorbed by the previously vulcanized material granuals 16, and some residual gases in the granuals and/or binder material used in making pipe 10, with

most blowing process formed [illegible] type channels 13 being developed in said [illegible] interconnecting channels 13 formed by the binder or matrial interlocking the granuals 16 into the product pipe 10. With processing of the pipe, while the granuals 16 generally retain their physical integrity, there is some degree of surface material welding or merging with the binder material.

Porous pipe 10 is extruded from a two stage wave screw extruder 18, such as shown in FIG. 4A, with the ingredient mix fed from hopper 19 to the product mix drive wave screw 20 contained within and extending through substantially the entire length of the relatively long extruder cylinder 21. Extruder 18 is generally typical of screw type extruders commercially available in both this country and abroad, equipped with a drive motor 22, a gear drive train section 23 output driving the wave screw 20. The extruder 18 is also equipped with a plurality of heating and cooling cylinder barrels 24 longitudinally positioned along the length of extruder cylinder 21, with each having cast-in resistance elements connected through wires 25 and 26, and cast-in cooling coils connected through cooling fluid lines 27 and 28 to electrical power source control 29 and cooling fluid source control 30, such as shown with only one of the cylinder barrels 24, as a matter of convenience. A vent 31, connected to a vacuum control 32, is positioned at any convenient location along the extruder cylinder 21 and wave screw 20, longitudinally, after the product mix temperature has risen, through heating control and product mix working, that blow venting can occur through the binder material content of the product mix. The other vent 31 position constraint is that it must be positioned far enough ahead of pressure head screen 33 that there is not as yet a reflected back pressure build up at that location along the wave screw 20. The product mix, forced through pressure head screen 33, is extruded from the extruder die 34 where effective blowing creation of irregularly shaped labyrinth type channels 13 occurs with lowering of product material pressure from the high pressures at pressure head screen 33 down to atmospheric pressure. The feed throat member 35 below hopper 19 may be equipped with cooling and/or heating structure to further aid in temperature control of the product mix and extension of the possible positioning range of vent 31 toward the hopper 19.

Porous pipe 10 being extruded from the extruder die 34 very quickly enters, as shown in FIG. 4B, a cooling trough 36, approximately 40 feet long, filled with chilled water, at approximately 33° F. This quickly congeals the pipe binder matrices, with the blowing generated through wall passageways desired in the finished product. The pipe 10 is drawn from the cooling trough 36 by rubber tired, wheeled 37 and 38 puller assembly 39, and passed to a conventional reel pipe coiler 40.

Referring also to the enlarged extruder die 34 tip end of the extruder 18 product mix forced through pressure head screen 33 flows by thin vains 41 extended from mount ring 42 as supports for porous pipe I.D. die mandrel 43 and mandrel base 44 into which the I.D. die mandrel 43 is threaded. A center opening 45 in I.D. mandrel 43 is connected through passage 46 in base 44 and pipe 46 to the exterior for venting of the interior of pipe being die extruded to atmosphere as it first comes from the die.

Excellent product production runs are obtained, for example, with prevulcanized material granuals ground from old rubber tires with metal removed but soft cord-

is a [illegible] mixing in a granular size consistency [illegible] pass through a 30 mesh screen. These pre-[illegible] vulcanized granuals, as approximately 70% of the product mix, are mixed with the remaining 30% of the product mix in the hopper 19 of extruder 18. This is with the 30% of the product mix comprised of, by percentages:

Polyethylene (high density) — 70%
Vinyl — 14%
ABS (Binder) — 15% Attaclay — 1%

The product mix is fed from the hopper 19 into the input end of the extruder cylinder 21 to product mix drive screw 20, where heat input and heat of working initially brings the product mix temperature up to approximately 300° F. Next, down the screw drive in the direction of material flow, before, and as the product mix approaches vent 31, the product mix temperature is raised to approximately 350° F, generally in the range of 350° to 400° F, and then with venting and immediately thereafter the product mix is cooled down to approximately 300° F. Then the product mix is heated up again to approximately 350° F as the product mix is approaching the pressure head screen 33, along with a pressure build up to the approximate range of 2000 to 3500 p.s.i. at the screw 20 drive pressure side of the pressure head screen 33. The process temperatures used are generally high enough to transform the binder material content of the product mix to the moulten fluid plastic state such that flow venting can occur there through while the pre-vulcanized material granular generally retain their integrity, other than for some degree of surface welding or merging with the binder material in the interconnecting matrices 17. The porous pipe 10 is screw pushed out through the extruder die 34 into cooling trough 36 from which it is pulled and then rolled. Venting to a vacuum of 20 inches of mercury at vent 31 gives a product standard pipe with a seepage flow rate of 15 gallons per 100 feet per hour at five p.s.i. internal water pressure, as shown in FIG. 6, with the effective blow venting seepage passage action occurring as the pipe 10 is being extruded to the atmosphere. Venting to a five inch mercury vacuum with approximately the same product process temperatures results in the highest leak pipe rate of 40 gallons per 100 feet per hour at 5 pounds p.s.i. water pressure. Further, venting to 25 inches of mercury vacuum results in the lowest leak pipe, with 12 gallons per 100 feet per hour at 5 pounds p.s.i. water pressure. The venting provided at vent 31 is quite effective at the preset mix temperature at that process location at volatilizing the residual moisture and gas content in the product mix for good uniform blowing action control as pipe 10 is extruded to atmosphere from the die end 34.

The product mix may be varied with the pre-vulcanized material granuals being in the range of approximately 60 to 90 per cent of the product mix, and the binder material being in the corresponding related range of approximately 40 to 10 per cent of the product mix. Further, the binder material may be the mix previously outlined, or any one or two of the materials including polyethylene, vinyl, ABS (binder) with a trace of attaclay, or without, as may be used for product variation results as desired. In any event, the binder substance (whether of one or more ingredients) is transformed to the plastic or moulten state at the process temperatures used, and with mixing action within the screw extruder while the previously vulcanized material granuals generally retain their structural integrity.

Whereas this invention is herein illustrated and described primarily with respect to several embodiments hereof, it should be realized that various changes may be made without departing from essential contributions to the art made by the teachings hereof.

I claim:

1. A method of extruding porous irrigation pipe and the like comprising:

forming a mixture of granular elastomeric material having residual moisture therein and a plasticizable binder material,

feeding the mixture into and through an extruder to plasticize said binder material,

extruding said pipe from said extruder, with said residual moisture being vaporized and with said binder material interlocking the granules of said elastomeric material to form labyrinth-type channel-like apertures in said pipe as said mixture is extruded, and

maintaining said elastomeric material in granular form during the extrusion of said pipe.

2. The method described in claim 1 wherein said elastomeric material is vulcanized granular material of generally less than one-sixteenth inch diameter.

3. The method described in claim 2 wherein said binder includes polyethylene.

added by amendment

205869

United States Patent [19]

Turner

[11] 4,168,799

[45] * Sep. 25, 1979

[54] SOAKER HOSE

[75] Inventor: James E. Turner, Southlake, Tex.

[73] Assignee: Entek Corporation, Dallas, Tex.

[*] Notice: The portion of the term of this patent subsequent to Jan. 18, 1994, has been disclaimed.

[21] Appl. No.: 833,803

[22] Filed: Sep. 16, 1977

[51] Int. Cl.[2] A01G 27/00

[52] U.S. Cl. 239/145; 138/118; 138/177; 405/45

[58] Field of Search ..... 239/145, 269; 138/118, 138/177, 178, DIG. 1, 40; 61/10-13; 260/710, 717, 720, 722, 723-725, 729, 730, 732; 264/53; 210/170, 497

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2,807,505	9/1957	Weitzel	239/145
3,774,648	11/1973	Edlin	138/177
4,003,408	1/1977	Turner	239/145 X

Primary Examiner—John J. Love

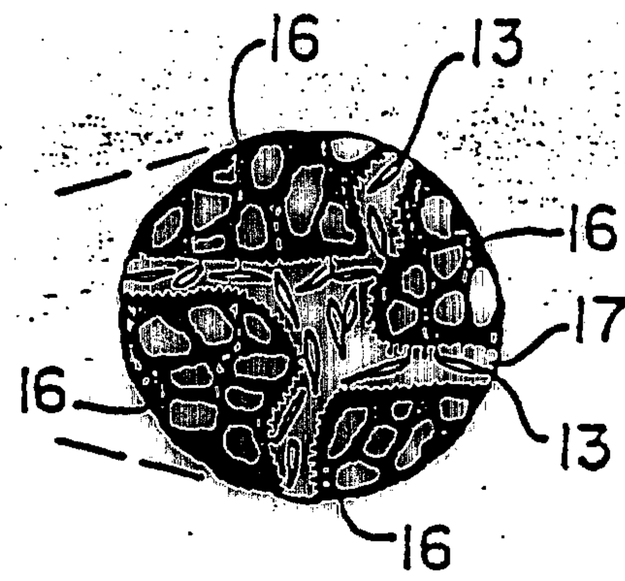
Assistant Examiner—Andres Kashnikow

Attorney, Agent, or Firm—Warren H. Kintzinger

[57] ABSTRACT

A porous flexible hose primarily of crumbed rubber and synthetic rubber reclaimed from rubber tires, ground to a relatively small granular size, with metal removed; such as, for example, would pass through a 30-mesh screen, process-mixed through an extruder, with a much smaller binder mix of primarily polyethylene, in the order of 25% by weight, and with approximately 0.5% of the mixture added sulphur and 0.5% oil that can be random mixed grades of automobile engine oil. The resulting product is useful as a soil watering soaker hose that has a high degree of flexibility along its length. It is a water leaking soaker hose formed in the process through the extruder with limited foaming from steam originating from absorbed moisture in the crumbed, reclaimed rubber tire material, and from residual gases venting from the material mix, with product mix heating in the extruder, forming some open cell fluid flow paths. The foaming with steam and gases from the mix also form labyrinth passageways between the rubber tire granules and the polyethylene binder mix, and also through the binder mix that is non-compatible with the rubber granules but that forms a physical interconnective structural material binder therefor.

17 Claims, 7 Drawing Figures



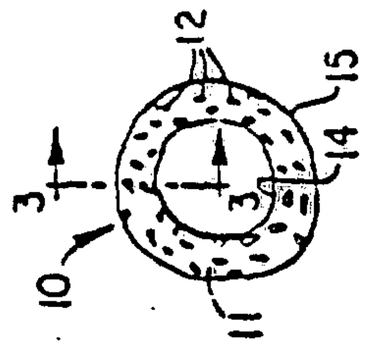


FIG. 2

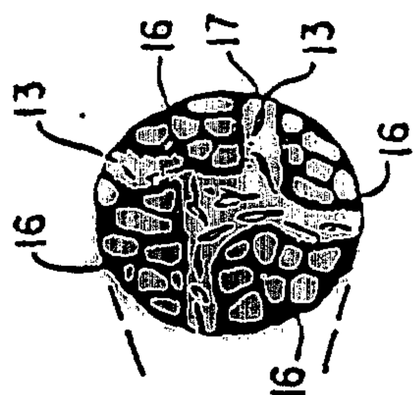


FIG. 3B

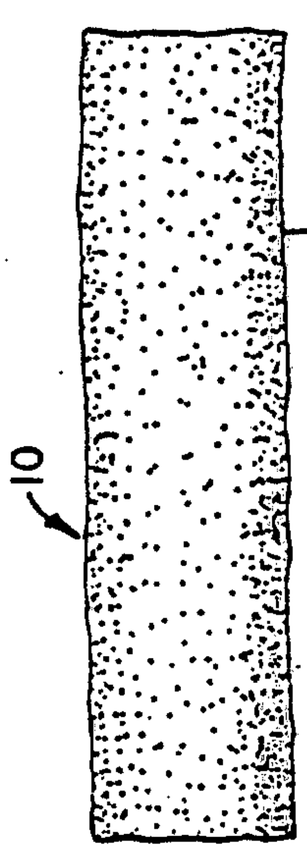


FIG. 1

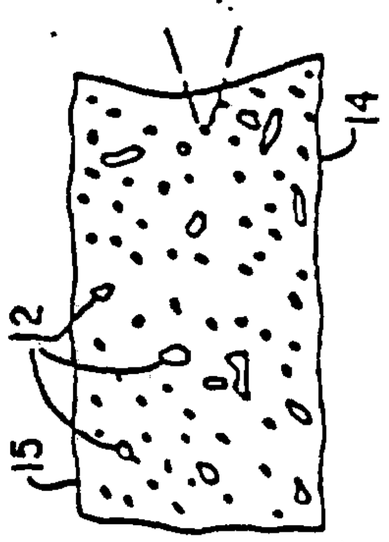


FIG. 3A

FIG. 5

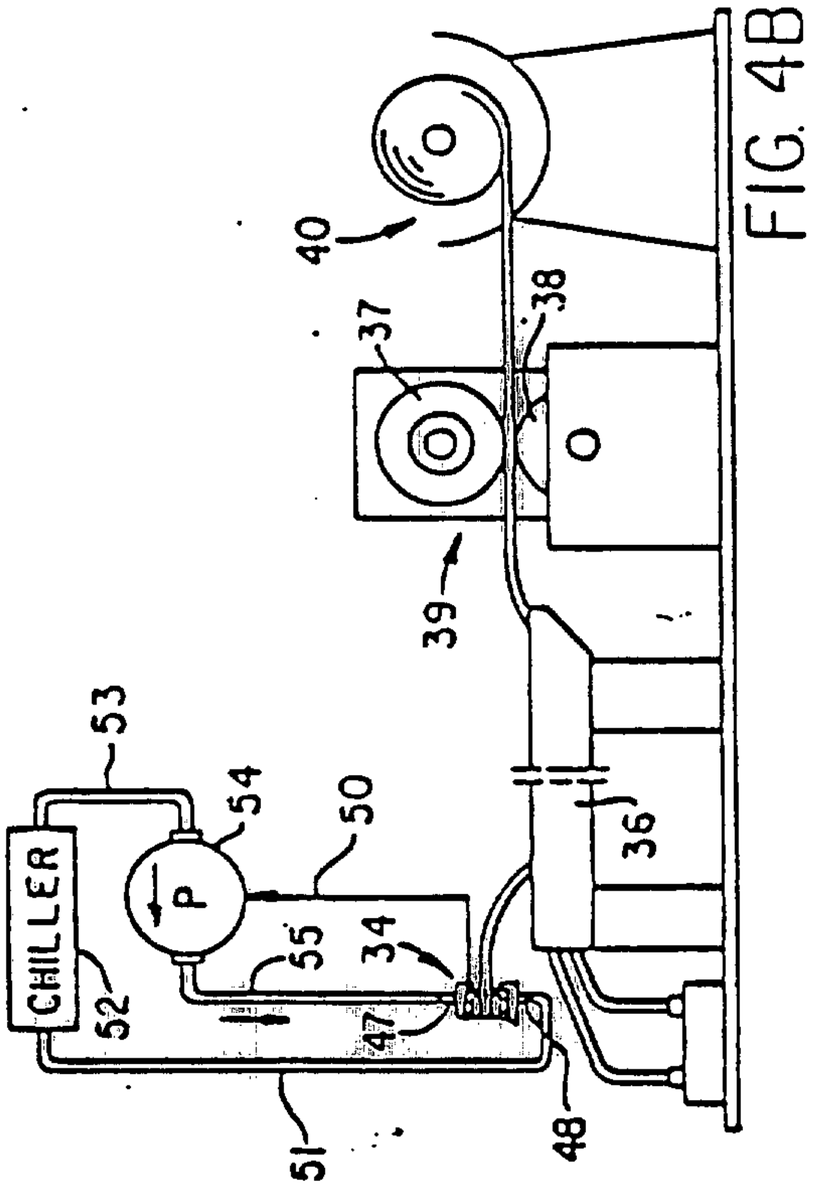


FIG. 4B

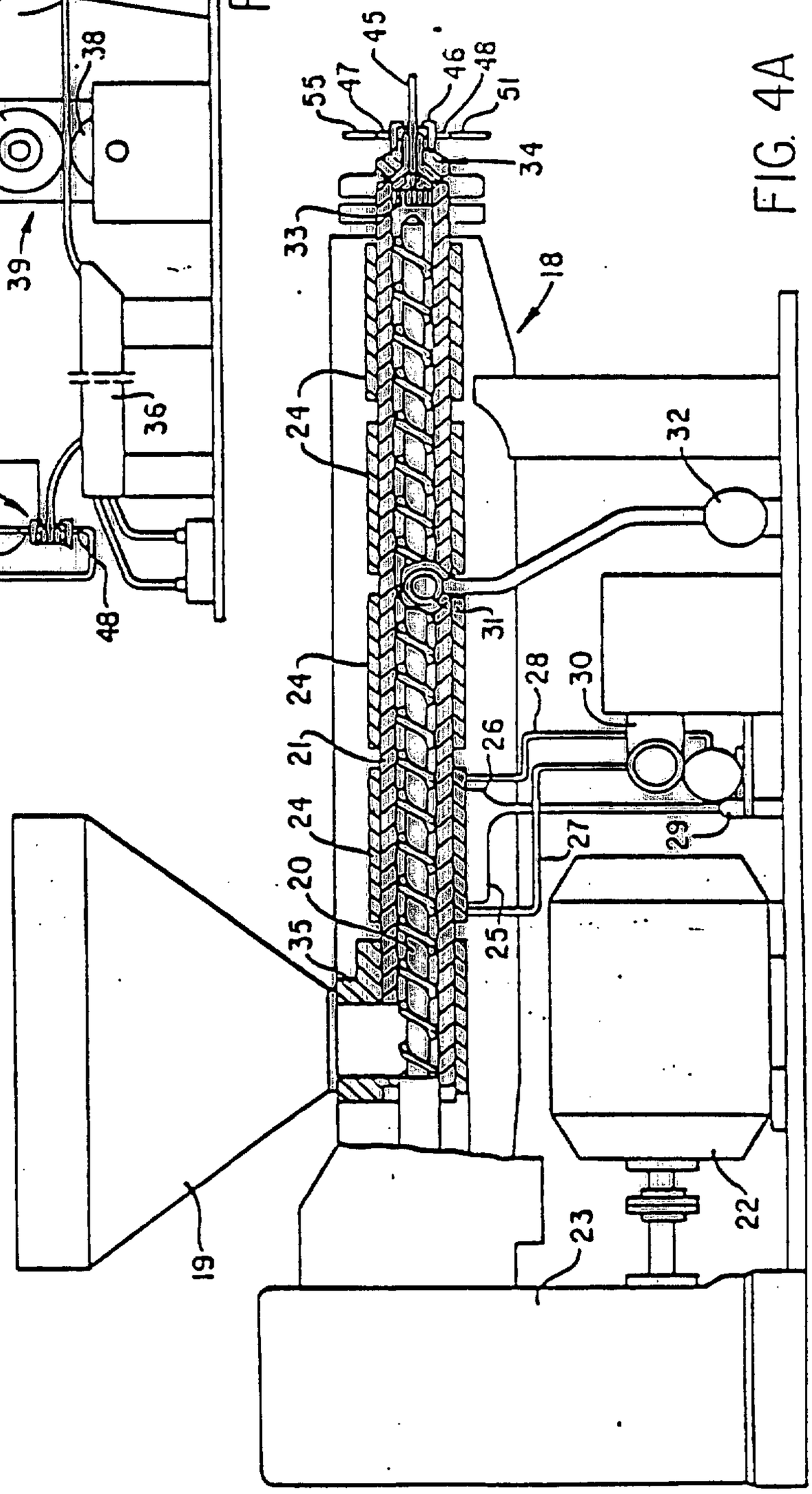


FIG. 4A

SOAKER HOSE

This invention relates in general to watering vehicles and, in particular, to a porous hose processed primarily of crumbed rubber tires of small granular size, mixed with a binder, mainly of polyethylene, and useful in applying measured amounts of water to gardens, lawns, etc.

For healthy plant growth and optimized crop production, and with turf grasses, it is water passing to the root zone area of the soil that counts. With soaker hose watering, the water enters the soil and penetrates to the root zone to benefit the growing plants. Moisture that wets only the above-ground portions of grass plants and the layers of organic material and soil above the root is of particularly no value, and may be harmful with mineral salt crustation build-up through evaporation depositions of mineral content at the surface. A dense sod, for example, may absorb a quarter-inch or more of water before any of it enters the soil. Light, above-ground waterings encourage shallow rooting, thus producing plants that are subject to quickly drying out during intervals of no watering.

Various porous hoses that have been produced in the past have a production problem in that in the process of trying to form a porous hose that actually leaks on the outer surface of the hose wall the extrusion process many times causes the outer surface to be sealed or glazed as it comes out of the extrusion die. In overcoming this problem at least one hose product is scratched or lightly cut to penetrate the surface glaze or thin sealed membrane on the outer surface. Some existing soaker hoses squirt or spew water so as to lead to greater than desired evaporation losses than is the case with my hose that swents water that trickles off to the soil or, when buried, feeds to capillation distribution through soil in accord with water absorption characteristics of the soil. Some plastic soaker hose has a short life under ultraviolet radiation of the sun whereas my hose has a greatly extended long life expectancy. This is attained through use of reclaimed crumbed rubber from automobile casings that has significant carbon black content yielding excellent ultraviolet inhibition and longer life expectancy.

Another consideration in the production of a new product is the availability of raw material in this day of shortages, and if it can be made primarily of reclaimed rubber, and/or synthetic rubber, from used tires that present a severe disposal problem, so much the better. Many sprinkling systems have continuing labor and maintenance costs, with requirements such as moving sprinklers, walking the line, pop up or protruding sprinkler heads that many times are struck and damaged or broken off by mowers or other equipment. Further, freeze-up of pipes and other water carrying equipment is a problem, and with severe cold waves, many times causes costly damage. Another consideration is that of interferenee with normal yard work, with, for example, a soaker hose water distribution system with soaker hose laid on the soil surface, and in some instances soaker hose is buried at an underground depth of ten inches or more, allowing all normal yard work, including roto-tilling. It is also important that nutrients and health-giving ingredients, some insecticides and, in some instances, herbicides, be distributed directly to the subsurface root zone in the soil of areas being irrigated as may be implemented with buried soaker hose.

Growth of weeds should be minimized rather than enhanced, and cultivation requirements with cash crops optimally minimized.

Underground irrigation, to many, falls under the general category of drip irrigation used, in any event, in the daily maintenance of an adequate section of the root zones of plants with moisture somewhere between dampness and saturation or field capacity throughout the growing season. This system enables the attainment of an optimized soil-water-plant relationship that is conducive to much better growth and substantially better yields, with less water applied. Evaporation is substantially totally eliminated, with buried soaker hose out of the way of people and machinery, and water, along with fertilizer when used, is applied where it obviously does the most good, right at the roots. Water seeps from the underground soaker hose, and by capillary action and absorption spreads through the root system, maintaining a constant moisture level throughout the area of treatment.

Variation in the water level content in soil can create many problems, with, for example, expansion and contraction of soil under and around slab foundations. This can be such as to cause foundations to shift around and/or cracking of the foundations, brick walls, inside plaster, and sheetrock walls in homes. Thus, an underground system for maintaining a stabilized soil moisture state would go far in eliminating such disasterous home and building damage. Aeration is important in sewage treatment systems, with air pumped into and bubbled upward through affluent in anaerobic action fluid treatment ponds and tanks, however, in most instances, attainment of desired bubble size is a problem. Most pumped-in, formed air bubbles, in many installations, are too large and gravitate to the surface much too rapidly, so any system that would create small bubbles such as would very slowly drift upward through an affluent mix, is highly desired.

It is therefore a principal object of this invention to provide a soaker hose irrigation system capable of efficiently supplying water to plants.

Another object with such irrigation systems is to minimize water requirements, to minimize evaporation loss to the air, and to avoid mineral salt build-up in the soil.

A further object is to attain a steady, slow-weeping application of water, feeding a capillary absorption distribution action through soil through needed periods of water irrigation.

Still another object is the attainment of stabilized soil conditions under and around building foundations and other structures such as swimming pools.

Features of this invention useful in accomplishing the above objects include, in irrigation soaker hose, a hose made primarily of ground-up reclaimed rubber and/or synthetic rubber, such as obtained from old tires. The reclaimed rubber granuals, that are ground to a size such as would pass through a 30-mesh screen, are process-mixed through an extruder, with a much smaller amount of binder ingredients that typically include: a binder mix of primarily polyethylene. The transverse cross-sectional area of the hose walls is thick enough to have labyrinth passageways for seeping of water to the exterior of the hose without soil-damaging water jets. The soaker hose is usable as a subsurface irrigation buried pipe, while having a high degree of flexability along its length. The soaker hose is formed in the process through the extruder, with limited foaming from

steam originating from absorbed moisture in the ground, reclaimed rubber tire material, and from residual gasses venting from the material mix, with product mix heating in the extruder, forming some open-cell fluid flow paths. Labyrinth passageways between rubber tire granular material and polyethylene binder mix, and through the binder mix, are also formed with the steam and gas foaming, or blowing, as the soaker hose is extrusion process formed.

A specific embodiment representing what is presently regarded as the best mode of carrying out the invention is illustrated in the accompanying drawings.

In the drawings:

FIG. 1 represents a partial side elevation view of applicant's irrigation porous soaker hose;

FIG. 2, an end view of the soaker hose of FIG. 1;

FIG. 3A, an enlarged section of soaker hose wall taken along line 3—3 of FIG. 2;

FIG. 3B, a further enlargement of a small portion of the soaker hose wall section of FIG. 3A;

FIG. 4A, a partially cut away and sectioned view of a vented and temperature regulated screw type extruder used in producing the porous soaker hose;

FIG. 4B, a partial side elevation view of a long, extended, cold water tank (or trough) receiving hot soaker hose from the extruder die, a soaker hose puller, and a hose coiler; and,

FIG. 5, a partially cut away and sectioned view of the extruder die tip end.

Referring to the drawings:

The porous soaker hose 10 with a short length, shown in FIG. 1, and in end view in FIG. 2, is made primarily or reclaimed rubber-like, previously vulcanized material such as that recovered from chopped-up old rubber tires with the metal removed. This rubber-like, previously vulcanized material is reground to generally less than one-sixteenth inch diameter granual size, even down to a size that passes through a 30-mesh screen, before being process mixed with binder material, forming a matrix interlocking the rubber-like granuals in the processed pipe 10. While the wall 11 thickness to pipe I.D. is such, with the soaker hose material compounded for the finished pipe, to give reasonable structural integrity against soil loading collapse when buried in the soil as an underground irrigation water seeping soaker hose, it has a high degree of flexibility along its length in adjusting to required bends and turns necessary for both above ground use and underground installations. Foaming or blowing during product mix processing to the finish pipe 10 forms random pockets 12 (or voids) in the pipe wall 11, such as shown in more detail in the wall section enlargement of FIG. 3A where passageways to the exterior are not formed, or are late in forming with the blowing process action. Irregularly shaped labyrinth type channels 13 (shown in the further enlargement of FIG. 3B, an enlargement in the order of approximately 120X), formed in the blowing process action are an essential feature of the finished porous soaker hose product. Enough blow process formed channels 13 are formed, interconnecting the inner surface 14 and outer surface 15 of the soaker hose 10, either individually or via interconnected channels 13, to provide the desired through-the-wall seepage passageways. While the blowing formed pockets 12 are not the desired result, some of them do interconnect with some blowing process formed channels 13, as part of some of the through-the-wall seepage passageways. The desired blowing process is provided primarily with steam from moisture previously absorbed by the previously vulcanized material granuals 16, and some residual gases in the granuals and/or binder material used in making soaker hose 10, with most blowing process formed labyrinth type channels 13 being developed in and through the interconnecting matrices 17 formed by the binder material interlocking the granuals 16 into the product soaker hose 10. With processing of the sonker hose, while the granuals 16 generally retain their physical integrity, there is some degree of surface material welding or merging with the binder material.

Porous soaker hose 10 is extruded from a two stage wave screw extruder 18, such as shown in FIG. 4A, with the ingredient mix fed from hopper 19 to the product mix drive wave screw 20 contained within and extending through substantially the entire length of the relatively long extruder cylinder 21. Extruder 18 is generally typical of screw type extruders commercially available in both this country and abroad, equipped with a drive motor 22, a gear drive train section 23 output driving the wave screw 20. The extruder 18 is also equipped with a plurality of heating and cooling cylinder barrels 24 longitudinally positioned along the length of extruder cylinder 21, with each having cast-in resistance elements connected through wires 25 and 26, and cast-in cooling coils connected through cooling fluid lines 27 and 28 to electrical power source control 29 and cooling fluid source control 30, such as shown with only one of the cylinder barrels 24, as a matter of convenience. A vent 31, connected to a vacuum control 32, is positioned at any convenient location along the extruder cylinder 21 and wave screw 20, longitudinally, after the product mix temperature has risen, through heating control and product mix working, that blow venting can occur through the binder material content of the product mix. The other vent 31 position constraint is that it must be positioned far enough ahead of pressure head screen 33 that there is not as yet a reflected back pressure build up at that location along the wave screw 20. The product mix, forced through pressure head screen 33, is extruded from the extruder die 34 where effective blowing creation of irregularly shaped labyrinth type channels 13 occurs with lowering of product material pressure from the high pressures at pressure head screen 33 down to atmospheric pressure. The feed throat member 35 below hopper 19 may be equipped with cooling and/or heating structure to further aid in temperature control of the product mix and extension of the possible positioning range of vent 31 toward the hopper 19.

Porous soaker hose 10 being extruded from the extruder die 34 very quickly enters, as shown in FIG. 4B, a cooling trough 36, approximately forty feet long, filled with chilled water, at approximately 35° F. This quickly congeals the soaker hose binder matrices, with the blowing generated through wall passageways desired in the finished product. The soaker hose 10 is drawn from the cooling trough 36 by rubber tire wheeled 37 and 38 puller assembly 39, and passed to a conventional reel hose coiler 40.

Referring also to the FIG. 5 showing of the enlarged extruder die 34 tip end of the extruder 18 product mix forced through pressure head screen 33 flows by thin vains 41 extended from mount ring 42 as supports for porous soaker hose I.D. mandrel 43 and mandrel base 44 into which the I.D. die mandrel 43 is threaded. The mandrel 43 is found with extension 45 that extends up to approximately 8 to 12 inches beyond the extruder die 34

output opening outer end. A cooling water jacket 46 is also provided around the output end of die 34 with the jacket 46 having an input port 47 and an outlet port 48. A temperature sensing thermocouple 49 embeded in the output end of die 34 has, as also shown in FIG. 4B, a control line 50 connection to the cooling fluid circulation pump and control unit 54 for controlled circulation of cooling fluid from the fluid chiller reservoir 52, through line 53 to the pump unit 54, through line 55 to jacket inlet port 47, and from jacket outlet port 48 through line 51 back to the fluid chiller reservoir 52. This cooling control system is so set as to maintain a cool temperature in the die 34 in the area of thermocouple 49 down in approximately the 50–70° F. range in order that there be minimized plasticizing at the surface and limited scrufling of the outer surface of the hose 10 as it is extruded from the die. Cooling of the die 34 in this manner also cools the outer surface of the hose 10 such as to prevent (or minimize) heat sealing or glazing of the hose 10 outer surface 15 and thereby avoids the problems heat sealing or glazing would present.

Excellent product production runs are obtained, for example, with pre-vulcanized material granuals crumbed from old rubber tires with metal removed but soft cording remnants remaining in a granular size consistency that would pass through a 30 mesh screen. These pre-vulcanized material granuals, as approximately 75% of the product mix, are mixed with the remaining 25% of the product mix in the hopper 19 of extruder 18. This is with the product mix comprised of, by approximate percentages:

Pre-vulcanized material granuals—75%
Polyethylene (high density)—24%
Sulphur—0.5%
Oil—0.5%

High density polyethylene has been used having a density of 0.94 to 0.947 and a melt index of 0.22 to 0.55. The oil used can be used dirty engine oil picked up from service stations and other automotive centers. The oil acts as a plasticizer helping bind plastic together in a better more complete bond with itself and the old tire rubber crumbs. The oil also aids as a lubricant helping slide the plasticized molten resin through the extruder die to give a fairly uniform outer hose surface without excessive scrufling roughness. Addition of the oil also improves leaking consistency of the hose with the improved plasticizing and reduced scrufling friction in the extruder die. Sulphur, a vulcanizing agent in various and sundry rubber compounds, aids in binding and revulcanizing the rubber particles together again.

The product mix is fed from the hopper 19 into the input end of the extruder cylinder 21 to product mix drive screw 20, where heat input and heat of working initially brings the product mix temperature up to approximately 300° F. Next, down the screw drive in the direction of material flow, before, and as the product mix approaches vent 31, the product mix temperature is raised to approximately 350° F., generally in the range of 350° to 400° F., and then with venting and immediately thereafter the product mix is cooled down to approximately 300° F. Then the product mix is heated up again to approximately 350° F. as the product mix is approaching the pressure head screen 33, along with a pressure build up to the approximate range 2000 to 3500 p.s.i. at the screw 20 drive pressure side of the pressure head screen 33. Finally, as the hose 10 is being extruded from die 34, the outer surface is cooled, with cooling of the die outlet down to approximately 50°–70° F., to prevent outer surface sealing or glazing. The process temperatures used are generally high enough to transform the binder material content of the product mix to the molten fluid plastic state such that flow venting can occur therethrough while the pre-vulcanized material granuals generally retain their integrity, other than for some degree of surface welding or merging with the binder material in the interconnecting matrices 17. The porous hose 10 is screw pushed out through the extruder die 34 into cooling trough 36 from which it is pulled and then rolled. Venting to a vacuum of 20 inches of mercury at vent 31 gives a product standard hose with a seepage flow rate of 15 gallons per 100 feet per hour at five p.s.i. internal water pressure with the effective blow venting seepage passage action occurring as the hose 10 is being extruded to the atmosphere. Venting to a five inch mercury vacuum with approximately the same product process temperatures results in the highest leak rate of 40 gallons per 100 feet per hour at 5 pounds p.s.i. water pressure. Further, venting to twenty-five inches of mercury vacuum results in the lowest leak hose, with 12 gallons per 100 feet per hour at 5 pounds p.s.i. water pressure. The venting provided at vent 31 is quite effective at the product mix temperature at that process location at stabilizing the residual moisture and gas content in the product mix for good uniform blowing action control as hose 10 is extruded to atmosphere from the die end.

The product mix may be varied with the pre-vulcanized material granuals being in the range of approximately 60 to 85 percent of the product mix, and the binder material being in the corresponding related range of approximately 40 to 15 percent of the product mix. In any event, the binder substance is transformed to the plastic or molten state at the process temperatures used, and with mixing action within the screw extruder while the previously vulcanized material granuals generally retain their structural integrity. It should be noted that the soaker hose 10 can be used as a regular watering hose simply by unscrewing a cap from the hose end. With the cap removed, pressure is relieved and hose wall leaking is thereby reduced to a minimum to substantially result, in effect, a regular watering hose. The soaker hose may be manufactured in various lengths with standard hose fittings so that the soaker hose may be connected to standard faucets such as a ¾ inch threaded faucet.

Whereas this invention is herein illustrated and described primarily with respect to several embodiments hereof, it should be realized that various changes may be made without departing from essential contributions to the art made by the teachings hereof.

I claim:

1. A porous hose: comprising, primarily reclaimed rubber-like previously vulcanized material; a smaller portion binder mix of polyethylene, sulfur, and oil; with hose wall transverse cross-sectional area greater than transverse cross-sectional area of the hose opening; and with the hose walls containing a multiplicity of relatively small, in transverse cross-section, irregularly shaped labyrinth type channels providing many through-the-wall seepage passageways.

2. The porous hose of claim 1, with said rubber-like, previously vulcanized material comprising crumbed bits generally less than one-sixteenth inch in diameter.

3. The porous hose of claim 2, with the smaller binder mix of polyethylene, sulfur, and oil comprising a per-

centage by weight in the product of approximately 25%.

4. The porous hose of claim 3, with said smaller binder mix comprising a predominance of polyethylene and substantially smaller percentages by weight of sulfur and oil.

5. The porous hose of claim 4, with said percentage by weight of sulfur and oil comprising approximately equal amounts of sulfur and oil totaling approximately 1 percent.

6. The porous hose of claim 4, with said polyethylene having a density of approximately 0.946 and a melt point in the range of 0.22 to 0.55.

7. The porous hose of claim 6, with said hose comprising a heat fused extruded casing of said materials, the outer surface thereof having been rapidly chilled as extruded.

8. The porous of claim 7, with said labyrinth type channels being sized to substantially preclude seepage therethrough of water flowing through said hose at a predetermined normal flow pressure.

9. The porous hose of claim 8, with said oil comprising used vehicle engine oil.

10. A porous hose: consisting primarily of bits of reclaimed vehicle tire casings less the metallic content thereof; a smaller binder material amount of polyethylene, sulfur, and oil; with hose wall transverse cross-sectional area greater than transverse cross-sectional area of the hose opening; and with the hose walls containing a multiplicity of relatively small, in transverse cross-section, irregularly shaped labyrinth type channels providing many through-the-wall seepage passageways.

11. The porous hose of claim 10, with said bits of tire casings comprising casings crumbed to form bits generally less than one-sixteenth inch diameter granular size, and comprising a percentage by weight in the product of approximately 75%.

12. The porous hose of claim 11, with said smaller binder material amount of polyethylene, sulfur and oil being comprised substantially of polyethylene.

13. The porous hose of claim 12, with said percentages by weight of sulfur and oil comprising approximately equal percentages of sulfur and oil totaling approximately 1 percent.

14. The porous hose of claim 13, with said polyethylene having a density of approximately 0.946 and a melt point in the range of 0.22 to 0.55.

15. The porous hose of claim 14, with said hose comprising a heat fused extruded casing of said materials, the outer surface thereof having been rapidly chilled as extruded.

16. The porous hose of claim 15, with said laybrinth type channels being sized to substantially preclude seepage therethrough of water flowing through said hose at a predetermined normal flow pressure.

17. The porous hose of claim 16, with said oil comprising used vehicle engine oil.

* * * * *

United States Patent [19]

Turner

[11] 4,191,522

[45] Mar. 4, 1980

[54] EXTRUDING MACHINE AND END PRODUCTS

[75] Inventor: James E. Turner, Southlake, Tex.

[73] Assignee: Estek Corporation, Southlake, Tex.

[21] Appl. No.: 962,872

[22] Filed: Nov. 22, 1978

Related U.S. Application Data

[63] Continuation of Ser. No. 799,244, May 23, 1977, abandoned.

[51] Int. Cl.[2] B29H 19/00

[52] U.S. Cl. 425/552; 264/328; 264/334; 425/543

[58] Field of Search 264/328, 334; 425/543, 425/552, 549, 554, 556

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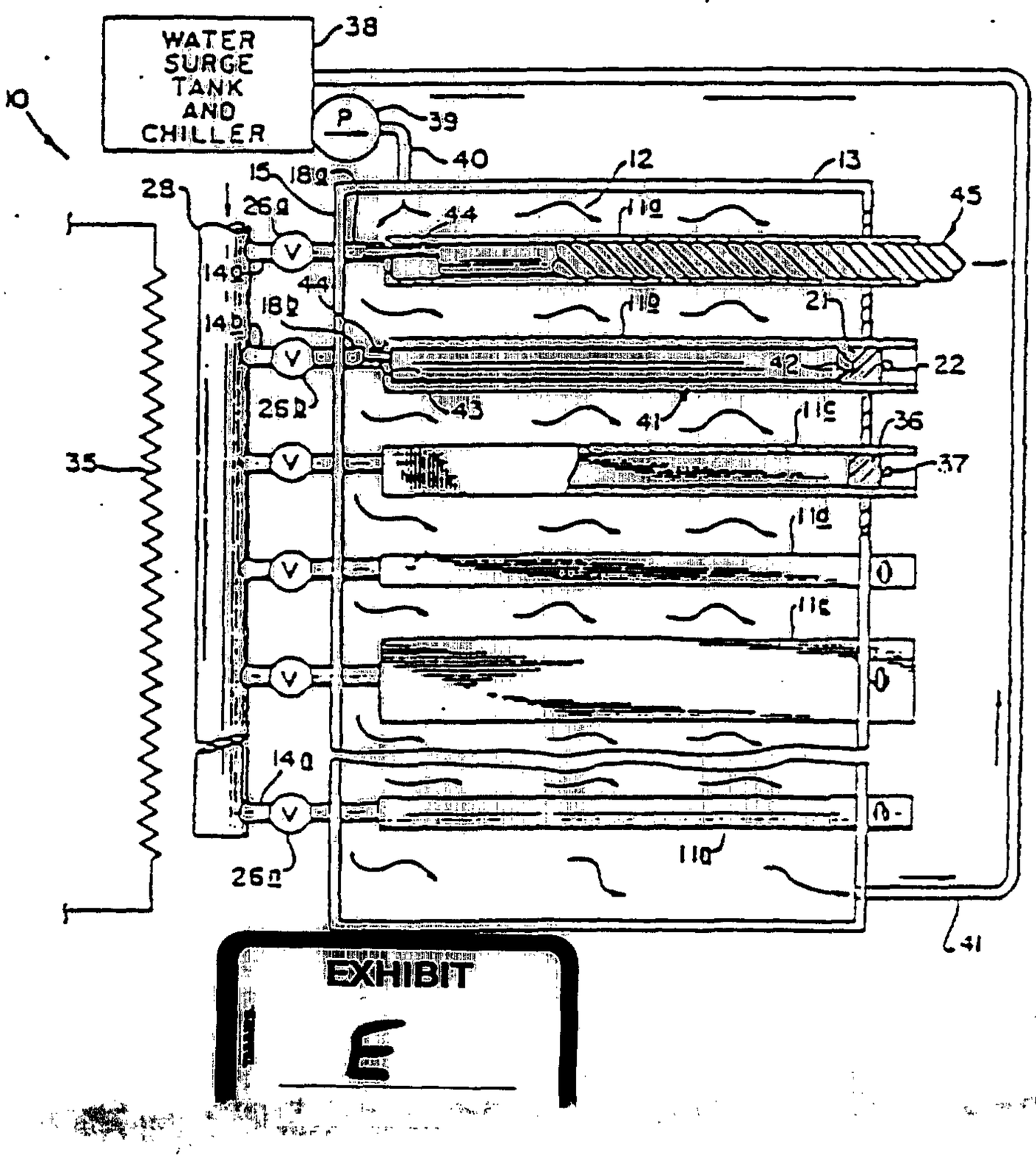
Primary Examiner—Thomas P. Pavelko
Attorney, Agent, or Firm—Warren H. Kintzinger

[57] ABSTRACT

A molding apparatus, using raw material substantially comprised of crumbed rubber tires, and producing end products of durability and structural integrity. Products such as fence posts and dimensioned pieces like dimension-lumber products, have a hardened, dense outer wall structure surrounding a comparatively less dense and relatively porous central core, with the attendent structure integrity advantages of tubular and hollow-walled products. Heat fused raw material is fed under pressure, as from a screw extruder mechanism, through selectively controlled input valves to mold bodies, with the mold bodies carried in a chilled environment to establish fluid flow paths and hardening sequences leading to the desired end product body structure.

7 Claims, 9 Drawing Figures



EXHIBIT

E

FIG. 1

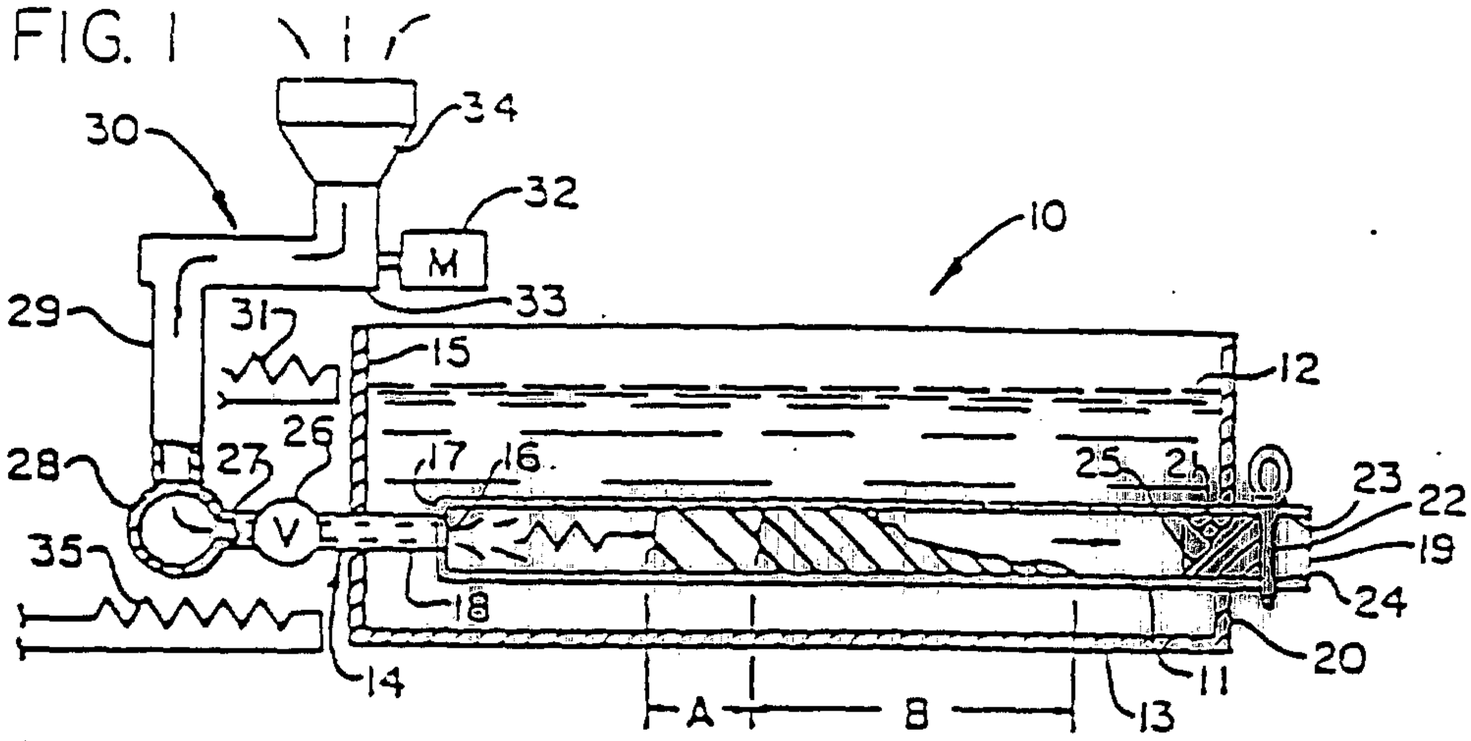


FIG. 2

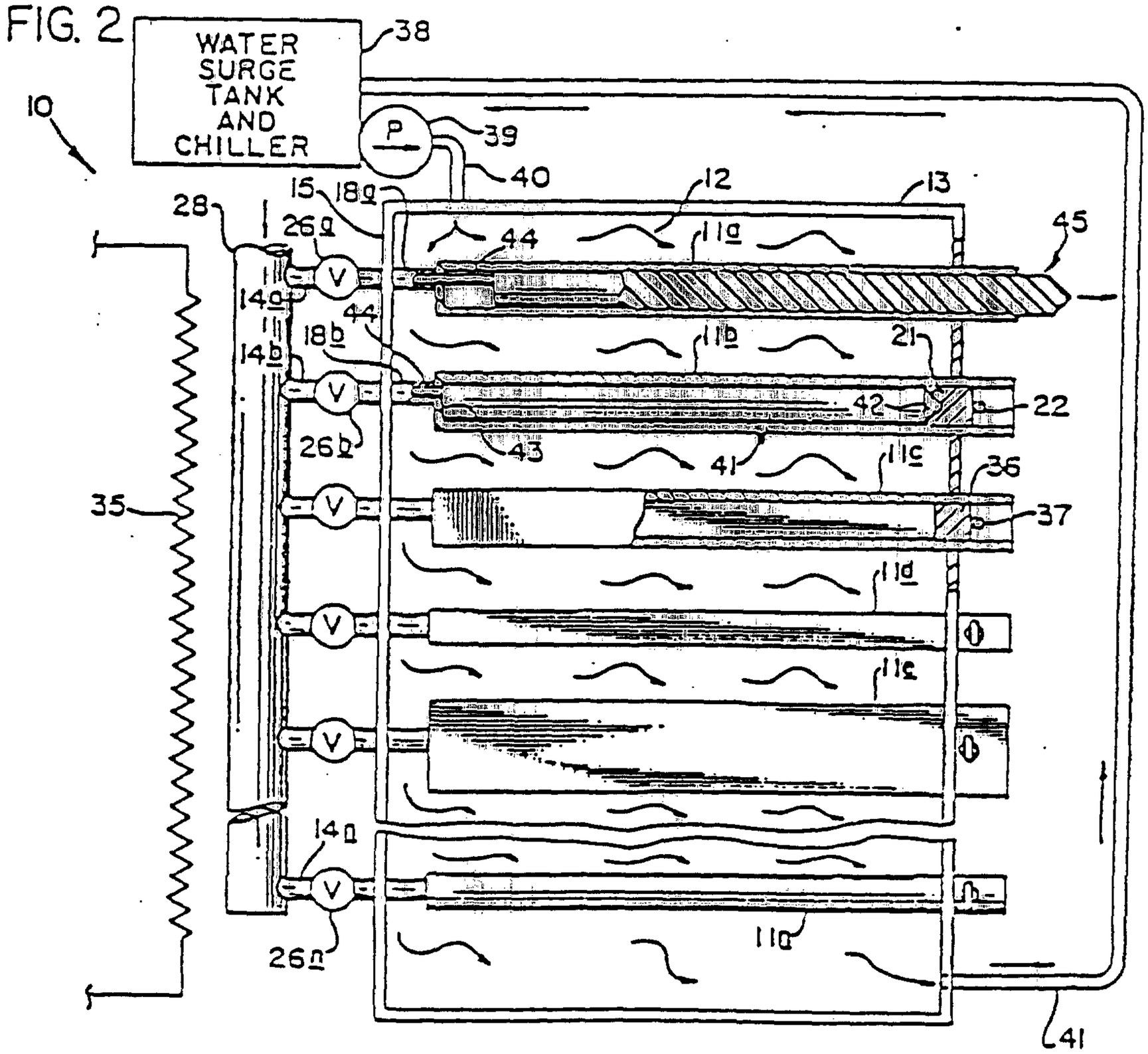


FIG. 4

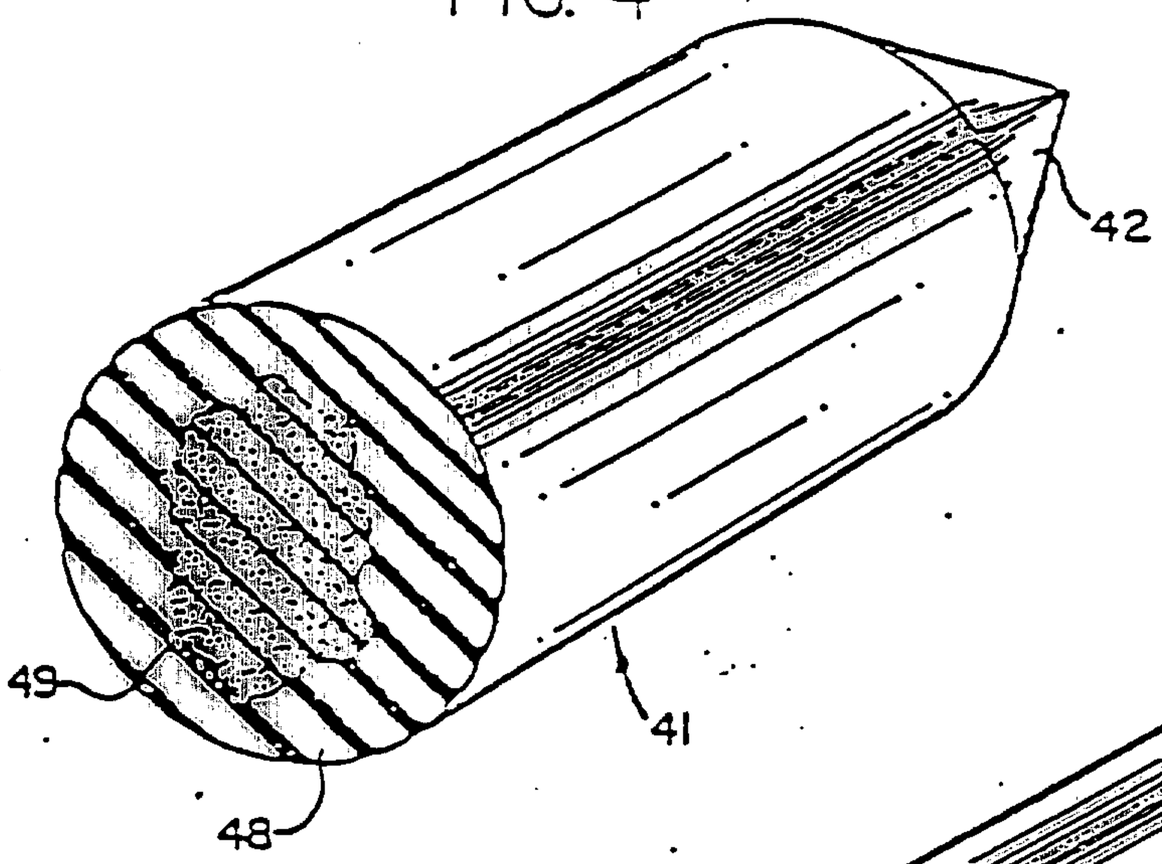
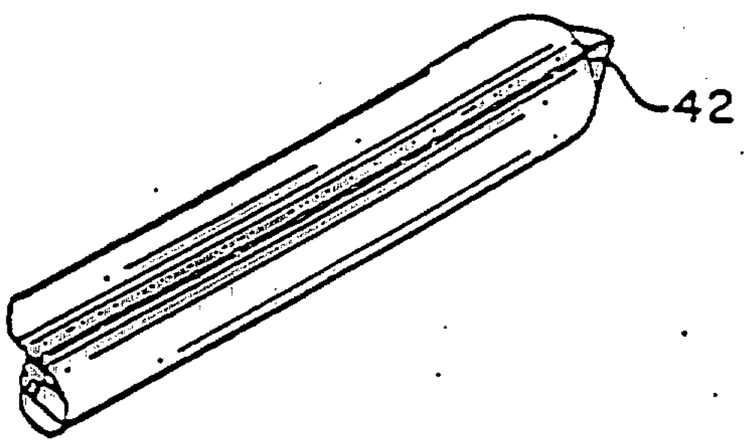


FIG. 3



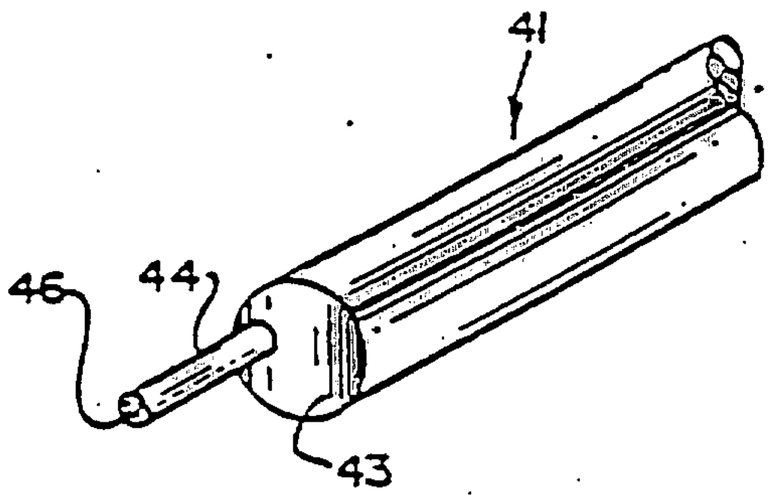


FIG. 3A

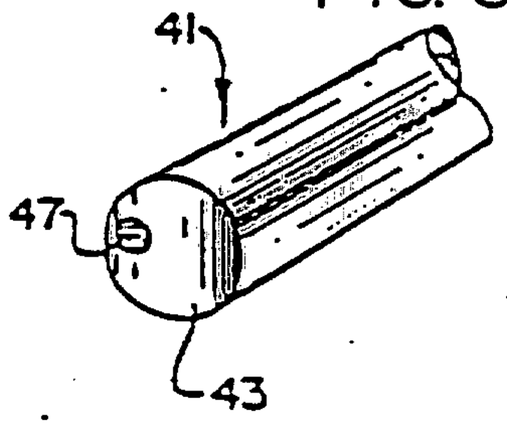


FIG. 5

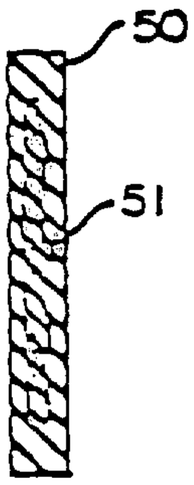


FIG. 6

FIG. 7

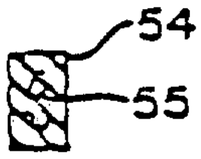
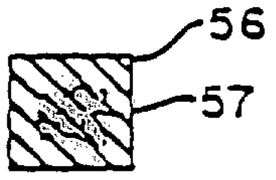


FIG. 8



EXTRUDING MACHINE AND END PRODUCTS

This is a continuation of application Ser. No. 799,244, filed May 23, 1977 now abandoned.

This invention relates in general to molded end-products and in particular to end products and an apparatus for making same from recycled rubber scrap.

Because of the nonbiodegradable characteristics of scrapped rubber products such as old automobile tire casings, and because of material shortages in general numerous products have been made, utilizing the scrap rubber advantageously as all or a substantial portion of a raw material mixture which may be heat fused and remolded into useful devices. Uniquely, the utilitarian aspects of many of these end products exceed that of similar products made of conventional materials. For example, in my U.S. Pat. No. 4,003,408 there is disclosed a porous underground irrigation pipe molded from a material mixture comprised substantially of particalized rubber tire bits. In my U.S. Pat. No. 4,028,288 there is disclosed porous container products useful, for example, as nursery pots, minnow buckets, garbage cans, etc.

Numerous wood products in use today, such as fence posts, railroad ties and dimension lumber are dependent upon our diminishing forest reserves as a source of material supply. For numerous applications wood products are especially vulnerable to rot and decay from excessive exposure to moisture, insects, dry-rot conditions, etc. Wood products must be coated with preservatives of some type when exposed to the environment. For example, railroad ties and fence posts have long been treated with creosote under pressure to protect the wood from moisture and boring insects. Special treatments and application of protective coatings of paints and oils add appreciably to the cost of wood materials and none are known to offer indefinite protection, with repeated treatment and eventual replacement adding more to the expense of wood product use.

It is, therefore a principal object of this invention to provide a new type of product for use in place of those conventionally made of wood; the new product having characteristics equalling or exceeding wood products used for the same purpose.

Another object is to provide a new product as a replacement for wood posts and dimension lumber which exhibits longer wear characteristics and appreciably greater immunity to rot and decay.

A further object is to provide a new wood replacement product which is economically produced from recycled scrap rubber.

Still another object is to provide an economical apparatus and effective method for making structural end products via pressure molding of a fused material mixture comprised substantially of particalized scrap rubber tires.

Features of this invention useful in accomplishing the above objects include the molding of end products from a fused, flowable raw material mixture comprised substantially of particalized scrap tires, with the fused material being pressure fed into an elongated mold with mold cross section definning the cross section geometry of the end product, such as a round post, and square or rectangular dimensioned pieces. The mold body is prechilled with chilling maintained after material injection, such that the outer body extremes harden rapidly into a dense mass, with the fluid inner core of the product being the last to flow such that attendant gasing results in a relatively porous central core. The end product then has the structural advantage of a tubular member, as opposed to a solid uniformally dense body, with attendant advantage of strength and resiliency. Fused material injection into the mold is accomplished through an input port communicating with one end wall of the mold at a location asymmetrically displaced from the longitudinal axis of symmetry of the mold body to provide for material flow paths within the mold conducive to a desired material hardening sequence which produces a dense outer surface layer with a porous central core. Removal of hardened end products from a selectively closable mold end opposite the input port end is facilitated uniquely by utilizing further application of injected fused material, with mold end opened, to push the hardened product from the mold.

Specific embodiments representing what are presently regarded as the best mode of carrying out the invention are illustrated in the accompanying drawings.

In the drawings:

FIG. 1 represents a diagrammatic, partially sectioned, side view of an injection molding machine used to make the products of the invention;

FIG. 2, a diagrammatic partially sectioned top view of the apparatus of FIG. 1;

FIG. 3, an isometric view of a fence post member as removed from the apparatus of FIGS. 1 and 2;

FIG. 3A, an isometric view of the product of FIG. 4 with scrap residual appendage removed;

FIG. 4, an isometric cross-sectioned view of an end product of the apparatus of FIGS. 1 and 2, showing relatively dense outer wall areas and porous central core;

FIG. 5, is a cross-sectional view of a 2" by 12" dimensioned structural member producible by the apparatus of FIGS. 1 and 2;

FIG. 6, a cross-sectional view of a 1" by 6" dimensioned structural member;

FIG. 7, a cross-sectional view of a 2" by 4" dimensioned structural member; and

FIG. 8, a cross-sectional view of a 4" by 4" dimensioned structural member.

Referring to the drawings:

A molding machine 10 is shown in the side view of FIG. 1, depicting a single tubular mold body 11 substantially completely immersed in a bath of water 12 carried in a tank member 13. A material input line 14 extends through side wall 15 of the tank into communication with an input port 16 formed through the input wall end 17 of the mold body. A predetermined extent 18 of input line 14 is exposed to the water within the tank between tank wall 15 and input end wall 17 of the mold body.

The other end 19 of the mold body extends through end wall 20 of tank 13. A removal end plug member 21 is shown inserted in the mold body end 19 and is restrained from outward movement, as might be imposed by pressure within the mold body, by means of a clevis-like pin member 22 extended through diametrically opposed through-holes 23 and 24 in the mold body wall. As shown in FIG. 1, the end plug might have an inner face 25 formed as a concave conical surface, and the mold body 11 be in cylindrical form, so as to define a mold for a round post end product with pointed end.

Input line 14 to the mold body 11 is shown with an in-line flow control valve 26 and with input end 27 communicating with a material supply manifold 28. Manifold 28 receives heat fused input material from the

output line 29 of a wave screw extruder mechanism 30. Extruder mechanism may comprise a conventional wave screw device complete with heating element means as functionally depicted in FIG. 1 by heating element 31, and motor means 32 to power the screw. Particalized raw material bits are supplied to the input end 33 of the wave screw extruder mechanism from a material hopper 34, which for purposes of the present invention would hold a supply of particalized rubber tire bits. In conventional manner, the raw material bits are heat fused and caused to be extruded through mechanism 30 to supply, under pressure, a flowable heat fused mass through output line 29 to manifold 28, and through valve 26 (when opened) to the input port 16 of the mold body 11. Further heating element means 35 are functionally depicted in FIG. 1 as being associated with the manifold 28 and mold input line 14, for the purpose of maintaining the material therein in a heat-fused, flowable state.

As depicted in FIG. 1, with power and raw material supplied to extruder mechanism 30, and extruder motor 32 energized, the opening of valve 26 in supply line 14 causes a flow of fused material into the confines of the mold body 11 and toward the plugged end 19 of the mold body. With the mold body being chilled, hardening of the fused material commences immediately at the outer edges of the mold, which are most directly exposed to the chilled water 12 in tank 13, and progressively through the central material flow path back to the input post end of the mold body, as depicted by progressively less hardened portions B and A of the hardening material. With the hardening accelerated at the edge extremes of the material most adjacent the chilled mold body walls, the outer wall portions of the hardened end product in the mold body are of considerable hardness and density, while subsequent center core fused material flow, through gassing, hardens into a relatively porous and comparatively much less dense mass.

FIG. 2 depicts a top view of the apparatus, with a plurality of mold bodies 11*a*–11*n* carried in chilling tank 13. A variety of mold bodies are shown. Mold bodies 11*a* and 11*b* are exampled as identical bodies each producing the aforedescribed end-pointed post as the molded end product. Also exampled is a mold body 11*c* with flat surfaced end plug 36 restrained by clevis 37, and which might be cross-section dimensioned for producing 2" by 2" dimensioned end products. Mold body 11*d* might be dimensioned to produce 1" by 2" dimensioned output products, with mold bodies 11*e* and 11*h* being respectfully dimensioned to produce still other standard or non-standard dimensioned end products.

As shown in FIG. 2, each of the molds, as exampled for mold bodies 11*a* and 11*b* has the input port end of the body connected with material manifold 28 through an associated input supply line which is fitted with an input flow control valve. Supply line 14*a* connects mold body 11*a* to the manifold, with material input fed selectively through valve 26*a*. Supply line 14*b* connects mold body 11*b* to the manifold with material fed selectively through valve 26*b*. As in FIG. 1, each of the supply lines connects to a mold body input port at a point displaced from the longitudinal axis of the associated mold body in relatively close proximity to a mold body side wall. Also, each input supply line has a portion thereof extending through the tank wall 15, such as extents 18*a* and 18*b* shown for the exampled supply lines 14*a* and 14*b*.

As in FIG. 1, a heater element 35 is functionally depicted as being associated with the manifold and input control valves for the purpose of maintaining material in the manifold and supply line portions exterior of the chill tank in a heat-fused, flowable state.

Chill tank 13 of FIG. 2 carries a sufficient quantity of water to completely immerse the mold bodies and those extents of input material supply line carried within the tank. For purposes of maintaining the water 12 in at a desired chilling temperature, and for rapid heat transfer from the molds in the tanks, a water surge tank and chiller 38 and associated pump 39 supply a flow of chilled water through input line 40, with water flow through the tank and via recirculating return line 41 to surge tank and chiller 38.

In operation, any one of the material input control valves may be opened to cause fused material to flow into the associated mold body, with end plug retained by the associated clevis. For example, FIG. 2 depicts mold body 11*b* (second from the top) as having been filled with fused material which was subsequently hardened to form a post end product 41 having a pointed end 42 and flat opposite end 43 from which extends a hardened projection 44 with cross-section defined by that of the supply line 14*b* and length defined by the extent 18*b* of supply line 14*b* which extends through the chilled water in the tank. Now, if the end plug 21 of mold body 11*b* were removed, a subsequent application of pressurized fused material through valve 26*b* would exert a force against the end of the hardened projection 44, using the projection 44 as a piston to force the projection 44 and attached end product 41 from the open output end of the mold body. This latter defined action is depicted for the uppermost depicted mold body 11*a* in FIG. 2, where projection 44 has moved inwardly by the extent that the end 45 of the molded piece has been forced out of the mold. It is now apparent that the projection 44 has been lengthened by the extent 18*a* of the supply line which is inside the chill tank. The molded piece may then be removed from mold body 11*a* by grasping the extended end 45 and applying a longitudinal pull force, whereupon, the projection 44 attached to the outer end fractures easily in the vicinity of the juncture of supply line 14*a* and tank wall 15 where the raw material remains in a soft, unhardened state due to the heat supplied to that portion of the supply line external of the tank.

A molded fence post 41, as pulled from its associated mold is shown in FIG. 3 as comprising a pointed end 42, and an opposite flat end 43 from which projection 44 extends. The terminus 46 of projection 44 represents the rupture point occuring in the vicinity of the tank wall, where only semi-hardened material parted as the post was pulled from the mold body. Projection 44, due to a relatively small cross-section, may then be ruptured or cut from the flat end 43 of the post at juncture 47 (as shown in FIG. 3*a*) and be discarded as waste.

It is thus seen that the molding apparatus uniquely employs the raw material source to mold the desired end product and, in addition, because it is selectively applied under pressure to the mold body, employs raw material to initiate removal of the molded end product from the mold end by forming an attached "piston-rod", as it were, to the outer end of the molded product and using subsequently applied raw material source pressure applied against the end of this attached "piston-rod" to force a length of end product from the mold body end sufficient to facilitate grasping and pulling of

the end product from the mold, with attached "piston-rod" easily, rupturable of a semi-hardened point, and subsequently easily removable from the end product end as minimal waste. It should be noted that removal of the chilled hardened product is made easier by shrinkage within the mold as the products are chilled and hardened.

It is to be realized that, in employing multiple mold bodies, each with its associated input flow control valve, various sequencing operations would permit filling one mold while removing the end product from a previously filled and chilled mold body, etc. to maximize production rate from the plural mold apparatus.

Exampled end products are indicated in FIGS. 4—8. FIG. 4 shows a round post with high density outer wall portion 48 surrounding a less dense, relatively porous central core 49. FIG. 5 shows a 2" by 12" dimension piece in cross-section, with dense outer wall portion 50 surrounding porous central core 51; FIG. 6, a 1" by 6" dimension piece with dense outer wall portions 52 surrounding a porous central core 53; FIG. 7, a 2" by 4" dimension piece, with dense outer wall portions 54 surrounding a porous central core 55; and, FIG. 8, a 4" by 4" dimension piece with dense outer wall portions 56 surrounding a porous central core 57. Other products such as railroad ties may be produced by this process with, for example, the showing of FIG. 8 being a typical cross-section showing thereof enlarged, of course, from 4" by 4" size.

Whereas this invention is herein illustrated and described with respect to several embodiments thereof, it should be realized that various changes may be made without departing from essential contributions to the art made by the teachings hereof.

I claim:

1. An end product molding apparatus comprising an elongated hollow mold having a predetermined length and internal cross-sectional geometry respectively defining the length and cross-section geometry of a discrete product to be individually molded and subsequently removed from said mold; said mold having a predefined longitudinal axis of symmetry; plug means for selectively closing one end of said mold; said plug means having a mold interior facing end thereof defining a selected mold end geometry; an input supply line having a flow axis parallel to and displaced from the longitudinal axis of symmetry of said mold; said input supply line communicating with a material input port passed through the closed other end of said mold; said supply line and input port having a cross-sectional area substantially less than that of said mold; with substantially the entire cross-sectional area of said input port being displaced from the mold longitudinal axis of symmetry; said supply line being selectively connectable to a pressurized, heat fused flowable material source; enclosure means, means for maintaining the interior of said enclosure means at a chilled ambient temperature; with a predetermined longitudinal expanse of said input supply line being extended within said enclosure means and substantially all of said mold extending within said enclosure means with said one end thereof extended externally of said enclosure means.

2. The apparatus of claim 1, with said mold having a circular cross-sectional area and said input port communicating with the confines of said mold symmetrically about an axis radially displaced from the longitudinal axis of symmetry of said mold.

3. The apparatus of claim 1, with said mold having a cross-sectional area defined by respective pairs of opposed paralleled sides and said input port communicating with the confines of said mold symmetrically about an axis displaced from the longitudinal axis of symmetry of said mold and inwardly from one of said sides.

4. The apparatus of claim 1, with said mold having a rectangular cross-sectional area and said input part being symmetrically disposed about an axis inwardly from one of the smaller sides defining said rectangular cross-sectional area.

5. A plurality of the molds defined in claim 1, with respective input supply lines selectively connectable to a common manifold source of said pressurized, heat fused flowable material, and with each said mold and associated predetermined extent of supply line being extended through said chilled enclosure means.

6. The apparatus of claim 5, with said enclosure means comprising a tank means and with means for circulating chilled water through said tank means.

7. The apparatus of claim 6, with said input supply lines being selectively connectable to said material source through respective associated ones of a plurality of flow control valve means.

* * * * *

LAW OFFICES OF
JOHN FLOWERS
A PROFESSIONAL CORPORATION
540 FOUNDERS SQUARE
900 JACKSON STREET
DALLAS, TEXAS 75202-4425
(214) 741-5100

August 12, 1991

TO: ALL PARTIES ON THE ATTACHED LIST

Re: Entek Corporation, Case No. 391-31143-HCA-11
James E. Turner, Case No. 391-31144-HCA-11

Sale of Assets to Banstar Corporation

Attached is a copy of the Order Approving Sale of Assets to Banstar Corporation, which was signed by Judge Akard on August 8, 1991 and entered by the Bankruptcy Court on August 9, 1991.

The Closing of the sale of assets is scheduled for 10:00 a.m. on Monday, August 19, 1991, in my office.

completed on Aug 19, 1991

Very truly yours,

John Flowers

Att.

EXHIBIT F

IN THE UNITED STATES BANKRUPTCY COURT
FOR THE NORTHERN DISTRICT OF TEXAS
DALLAS DIVISION

IN RE:	$	
	$	
ENTEK CORPORATION,	$	CASE NO. 391-31144-HCA-11
	$	
DEBTOR	$	
	$	
	$	
	$	
	$	
JAMES E. TURNER,	$	CASE NO. 391-31144-HCA-11
	$	
DEBTOR	$	

ORDER APPROVING SALE OF ASSETS TO BANSTAR CORPORATION

On June 17, 1991, the Debtors, Entek Corporation ("Entek") and James E. Turner ("Turner") (collectively the "Debtors"), jointly with the Examiner, John Flowers (the "Examiner"), acting pursuant to the orders entered herein on February 5, 1991 and June 4, 1991 appointing and expanding the powers of the Examiner, filed a Joint Motion for Order Approving Sale of Assets to Banstar Corporation and Notice of Hearing (the "Joint Motion"). The Joint Motion seeks approval of a sale of substantially all of the Debtors' assets to Banstar Corporation ("Banstar") in accordance with the Asset Purchase And Sale Agreement dated June 14, 1991 (the "Sale Agreement") entered into by the Debtors, as sellers, Banstar, as buyer, and the Examiner, as escrow agent, a copy of which is attached to the Joint Motion on file herein. The assets to be sold to Banstar are generally described in the Joint Motion and described in detail in the Sale Agreement (the "Assets").

Notice of the hearing on the Joint Motion was sent to all creditors scheduled by the Debtors pursuant to the order entered on June 17, 1991. C. Lee Chipman ("Chipman") and Aquapore Corporation ("Aquapore"), both creditors of the Debtors, filed objections to approval of the Joint Motion (Chipman and Aquapore are collectively referred to as "Objectors").

The Court commenced the hearing on the Joint Motion on July 2, 1991 and adjourned the hearing to July 12, 1991. On July 12, 1991, the Debtors, the Examiner, Banstar, and Chipman and Aquapore announced that subject to the Court's approval the objection to the Joint Motion would be withdrawn and the terms of the proposed sale as set forth in the Sale Agreement would be modified and clarified in certain respects as more fully set forth below. Based upon the pleadings, the evidence, and the representations of counsel, the Court finds and orders as follows:

1. This Court has jurisdiction to hear this matter pursuant to 11 U.S.C. § 361 and 28 U.S.C. §§ 157 and 1334 and the order of reference of the District Court. This is a core proceeding pursuant to 28 U.S.C. § 157(b)(2).

2. The modification to the Sale Agreement announced on July 12, 1991 is as follows:

A. Any causes of action belonging to the Debtors under Bankruptcy Code §§ 542, 543, 544, 545, 547, 548, 549 and 550 are not included in the Assets to be sold to Banstar.

B. The Debtors' accounts receivable are not included in the Assets to be sold to Banstar.

C. The Debtors' inventory is not included in the Assets to be sold to Banstar.

D. Banstar will assume all liability for the claims of Aquapore and Chipman in the Debtors' bankruptcy cases and will indemnify these estates for any costs to the estates if those claims are not withdrawn. Banstar will assume all liability for the counterclaims asserted against the Debtors in the action commonly known as Entek Corporation and James E. Turner v. Southwest Pipe & Supply Company, et al. pending before the United States District Court for the Northern District of Texas, as Civil Action No. CA-3-84-2505 (the "Southwest Pipe Litigation"). In addition Banstar, the Debtors and the Objectors will take all necessary steps to dismiss with prejudice, and fully and finally release, all claims, demands, and causes of

action asserted or threatened in the Southwest Pipe Litigation against any of the defendants named at any time therein, their respective parent, subsidiary and affiliated companies, including, but not limited to, Aquapore Investments Limited, Aquapore Moisture Systems, J.V. ("AMS") and J. M. Keyser, Inc., or against any of the Debtors or counterdefendants, and such dismissal with prejudice shall be binding on all parties, including (i) the two Debtors' estates, (ii) Banstar and (iii) Objectors. Aquapore and Chipman will file a motion seeking to withdraw their respective claims provided such withdrawal is conditioned on the order dismissing with prejudice the Southwest Pipe Litigation becoming final and non-appealable. Within five (5) days after the date this order becomes final and non-appealable, AMS shall place $375,000 into an interest bearing escrow account held by the law firm of Weil, Gotshal & Manges to be paid to Banstar upon the order dismissing the Southwest Pipe Litigation becoming final and non-appealable. Banstar also agrees to not license any of the Assets for the life of the youngest patent for manufacturing for the retail market. (The foregoing agreement shall be referred to as the "Settlement").

E. Banstar waives all indemnification under the Sale Agreement from the Debtors and the Debtors' estates.

F. The total cash purchase price Banstar is to pay pursuant to the amended Sale Agreement is reduced to $787,500.

3. The modification to the Sale Agreement increases the value of the Sale Agreement to the Debtors' Estates. The reduction in the purchase price is approximately offset by the value of the inventory and accounts receivable which will be retained by the Debtors' estates. The indemnity required under the Sale Agreement will be waived by Banstar.

4. The notice of the Joint Motion, the hearing thereon, and the proposed sale was adequate and timely.

5. No party, other than AMS, a bidder for some of the assets, Aquapore, Chipman, and Turner, has appeared asserting an interest in the Assets, and the sale is to be free and clear of any such interests except Banstar's agreement with Aquapore that Banstar will not license for the life of the youngest patent any of the Assets for manufacturing for the retail market.

6. The purchase price for the Assets to be sold to Banstar is fair and representative of the value of such assets.

7. Banstar has acted in good faith in entering into the Settlement, as stated on the record to, inter alia, dismiss with prejudice the Southwest Pipe Litigation. The Objectors have likewise acted in good faith in entering into the Settlement with Banstar.

8. The rights of Water West under its distributorship agreement with the Debtors for eleven contiguous Western states have been negotiated between Banstar and Water West and Banstar will pay Water West the sum of $200,000 in connection with Water West's distributorship rights and such payment will be made directly to Water West and not through the Debtors' bankruptcy estates. The payment to be made to Water West by Banstar is in connection with Water West's distributorship rights as negotiated between Banstar and Water West and does not affect nor is it a payment upon Water West's claim in these bankruptcy cases. The Court makes no findings or orders regarding the allowance or disallowance of Water West's claim in these bankruptcy cases at this time.

9. The sale of the Assets to Banstar is in the best interests of the creditors of the Debtors' bankruptcy cases. The sale is based upon sound business purposes. The Debtors have been unable to operate at a profit during the pendency of those cases, and this Court previously ordered the

termination of the Debtors' operations. There is not a reasonable possibility for the Debtors to reorganize in the foreseeable future. The value of the Assets has declined during the pendency of these cases. The sale of the Assets will not affect the rights of creditors under any plan of reorganization because there can be no plan of reorganization in these cases, only a plan of liquidation. Given the inability of the Debtors to reorganize, the only right creditors have is their right to distribution in liquidation. Any distribution to creditors, whether through a plan of liquidation or a Chapter 7 liquidation, will be unaffected by the sale because the sale liquidates the assets into cash and in fact facilitates such distribution to creditors. Postponing the proposed sale until the Chapter 7 liquidation could occur will result in significant loss to the estates because it is improbable that Hanstar will be willing to continue its offer for the length of time required for the cases to be converted to Chapter 7, a Chapter 7 trustee to be appointed and qualify, familiarize himself with the assets and conduct the sale. It is therefore

ORDERED, ADJUDGED AND DECREED that the Joint Motion is hereby approved and the sale of the Assets to Hanstar

pursuant to the Sale Agreement, as modified herein, is hereby approved; it is further

ORDERED, ADJUDGED AND DECREED that the parties to the Settlement shall take all necessary steps to implement the Settlement within five (5) days from the date this Order is final, including (i) escrowing by AMS of $975,000.00 with Weil, Gotshal & Manges in an interest bearing account; (ii) filing all appropriate motions to dismiss with prejudice al claims in the Southwest Pipe Litigation; and (iii) executi all appropriate documents evidencing the Settlement.

ORDERED, ADJUDGED AND DECREED that the withdrawal of the objections is hereby approved and are deemed withdrawn, provided that the Settlement between Hanstar, the Objectors and the Debtors, as announced on the record, is implemented by these parties as a condition of consummating the Sale Agreement, as modified herein, including Hanstar's agreement not to license for the life of the youngest patent any of the Assets sold pursuant to the Joint Motion for manufacturing for the retail market; it is further

ORDERED, ADJUDGED AND DECREED that such sale shall be free and clear of all liens, claims and encumbrances and other interests; it is further

ORDERED, ADJUDGED AND DECREED that the Settlement of the Southwest Pipe Litigation, as announced on the record,

between Banstar, the Objectors, AHS, and the Debtors, is hereby approved; it is further

ORDERED, ADJUDGED AND DECREED Banstar, the Debtors and the Objectors shall take all necessary steps to dismiss with prejudice the Southwest Pipe Litigation as soon as practicable, but in no event later than five (5) days after this Order is final; it is further

ORDERED ADJUDGED AND DECREED that the sale proceeds shall be held in the possession of the Examiner pending further orders of this Court.

SIGNED this ~~day of July, 1991~~. AUG 16 1991

ORIGINAL SIGNED BY
/s/ JOHN C. AKARD

~~HAROLD C. ABRAMSON~~
UNITED STATES BANKRUPTCY JUDGE

AGREED TO AND APPROVED:

Deborah Horton, Esq.
State Bar No. 14558980
616 Texas St., #102
Fort Worth, Texas 76102
(817) 870-9858
COUNSEL FOR ENTEK CORPORATION

between Banstar, the Objectors, AHS, and the Debtors, is hereby approved; it is further

ORDERED, ADJUDGED AND DECREED Banstar, the Debtors and the Objectors shall take all necessary steps to dismiss with prejudice the Southwest Pipe Litigation as soon as practicable, but in no event later than five (5) days after this Order is final; it is further

ORDERED ADJUDGED AND DECREED that the sale proceeds shall be held in the possession of the Examiner pending further orders of this Court.

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Dallas, Texas 75202
COUNSEL FOR C. LEE CHIPMAN and
AQUAPORE CORPORATION

ASSIGNMENT OF TECHNOLOGY

THIS ASSIGNMENT OF TECHNOLOGY (this "Assignment") is made and entered into this 14th day of August, 1991, by ENTEK CORPORATION, a Texas corporation with an address at 722 South Kimball Avenue, Southlake, Texas 76051 (hereinafter "Entek"), and JAMES E. TURNER, an individual resident of the State of Texas with an address at 722 South Kimball Avenue, Southlake, Texas 76051 (hereinafter "Turner"), collectively as Assignors, to and for the benefit of BANSTAR CORPORATION, a Utah corporation with an address at 10614 Jaycee Lane, Houston, Texas 77024 (hereinafter "Banstar"), as Assignee. Entek and Turner are hereinafter sometimes collectively referred to as the "Assignors".

WITNESSETH:

WHEREAS, the Assignors have invented, developed and acquired certain technologies, patents, patent rights, licenses, know-how, trade secrets, trade secret rights, proprietary information, registrations and pending applications (including, without limitation, divisional, continuing, reissue, and foreign applications), all as more particular identified below; and

WHEREAS, the Assignors and Banstar have entered into a certain Asset Purchase and Sale Agreement, dated as of the 14th day of June, 1991 (hereinafter the "Asset Agreement"), pursuant to which the Assignors have agreed to assign and transfer such assets to Banstar.

NOW, THEREFORE, in consideration of the mutual covenants and agreements herein contained and for other good and valuable consideration, the receipt and sufficiency of which are acknowledged, the Assignors and Banstar hereby agree as follows:

1. Assignment. The Assignors, and each of them, hereby assign, transfer and convey to Banstar, and Banstar hereby accepts, all technologies, patents, patent rights, licenses, know-how, trade secrets, trade secret rights, proprietary information, registrations and pending applications (including, without limitation, divisional, continuing, reissue, and foreign applications) with respect to any of the foregoing, all discoveries and inventions described in or represented by any of the foregoing, all priorities and rights associated with any of the foregoing, and all other intellectual property rights relating to or associated with the operation and businesses of the Assignors, or either of them, or of the Plant (as such term is defined below), or to the manufacture, sale, or use of all products now or previously

EXHIBIT
6

produced by the Sellers, or either of them, or at the Plant, including, without limitation, (i) all products manufactured or sold under the trade name "Leaky Pipe", (ii) all products manufactured or sold under the trade name "MICRO 2", and (iii) all products manufactured or sold, or capable of being manufactured, in connection with what is commonly referred to as the "hard goods" business, (hereinafter collectively the "Technology").

The Technology shall include, without limitation, those patents, licenses, applications, and other matters described in Exhibit 2.1(d) attached hereto.

This Assignment shall include (a) any patent or patents of the United States and foreign countries that may be granted thereon, (b) all patents, patent applications, patent rights, trade secrets, trade secret rights, copyrights, copyright rights and all other intellectual property and intellectual property laws rights associated with the Technology, and (c) an assignment of all rights of priority in and to the Technology.

3. Cooperation. The Assignors, and each of them, shall cooperate fully with Sanstar in the protection and enforcement of Sanstar's rights in and to the Technology. Each of the Assignors shall sign all papers, instruments and documents, make all truthful oaths, and do all requisite acts necessary or, in Sanstar's sole opinion, desirable for the benefit of Sanstar in obtaining, enforcing, assigning, licensing or protecting any patents, patent rights, patent applications and licenses in which Sanstar acquires an interest pursuant to this Assignment including, without limitation, all such papers, instruments and documents of conveyance and assignment as may be necessary or desirable to cause the assignment effected hereby to be filed with the United States Patent and Trademark Office.

2. Definitions. For purposes of this Assignment, the term "Plant" shall mean the research, manufacturing, production and business office facilities of the Assignors, or either of them, located in Southlake, Texas, as of the date of the Asset Agreement, including, without limitation, the personal properties located at approximately 710 South Kimball Avenue and 722 South Kimball Avenue, Southlake, Texas as of the date of the Asset Agreement.

4. Miscellaneous. This Assignment is made and entered into pursuant to, and is subject to, the provisions of the Asset Agreement, which provisions, including, without limitation, all covenants, agreements, representations and warranties, are incorporated into and are made a part of this Assignment by this

reference. This Assignment shall be governed by and construed in accordance with the laws of the State of Texas.

IN WITNESS WHEREOF, the Assignors and Banstar have executed and delivered this Assignment of Technology the day and year first above written.

ASSIGNORS:

Entek Corporation,
a Texas corporation

By _____
James E. Turner
Its President

_____
James E. Turner, in his
individual capacity

BANSTAR:

Banstar Corporation,
a Utah corporation

By _____
Henry A. Sullivan
Its President

S:\wpc\064\CC000un4.x51
08/16/91

STATE OF TEXAS)
: ss.
COUNTY OF Dallas)

This instrument was acknowledged before me on August 19, 1991, by James E. Turner, President of Entek Corporation, a Texas corporation, on behalf of said corporation.

Sarah Young
NOTARY PUBLIC
Residing at: Dallas Tx

My Commission Expires
SARAH YOUNG
Notary Public, State of Texas
My Commission Expires 3-03-95

STATE OF TEXAS)
: ss.
COUNTY OF Dallas)

This instrument was acknowledged before me on August 19, 1991, by James E. Turner.

Sarah Young
NOTARY PUBLIC
Residing at: Dallas Tx

My Commission Expires
SARAH YOUNG
Notary Public, State of Texas
My Commission Expires 3-03-95

g:\wpc\064\00000

[redacted]

STATE OF TEXAS)
: ss.
COUNTY OF Dallas)

This instrument was acknowledged before me on August 19, 1991, by Henry W. Sullivan, President of Banstar Corporation, a Utah corporation, on behalf of said corporation.

Sarah Young
NOTARY PUBLIC
Residing at: Dallas TX

My Commission Expires:

SARAH YOUNG
Notary Public, State of Texas
My Commission Expires 3/13/95

g:\wpc\c64\00000\mtg.ag1
08/16/91

Exhibit 2.1(d)

(Attached to and forming a part of that certain Assignment of Technology by Entek Corporation and James E. Turner, as Assigners, to and for the benefit of Banstar Corporation, as Assignee)

Technology
(Description of patent, licenses, applications and other matters)

1. PATENTS.

Title	Number	Name
"Underground Irrigation Porous Pipe"	4,003,408	James E. Turner
"Soaker Hose"	4,168,799	James E. Turner
"Method for Extruding Porous Irrigation Pipe"	4,110,420	James E. Turner
"Extruding Machine and End Products"	4,191,522	James E. Turner
"Moldable End Products From Primarily Reclaimable Waste Materials"	4,028,288	Entek Corporation

2. PATENT APPLICATIONS.

Title	Number	Name
None		

S:\WDC\064\00000wh4.wpf
08/16/91

EMPLOYMENT AGREEMENT

This EMPLOYMENT AGREEMENT (this "Agreement") is made and entered into this 14th day of June, 1991 by and among Banstar Corporation, a Utah Corporation with an address at 10814 Jaycee Lane, Houston, Texas 77024 (hereinafter "Banstar"), and James E. Turner, an individual resident of the state of Texas with an address at 722 South Kimball Avenue, Southlake, Texas 76051 (hereinafter "Employee").

R E C I T A L S :

A. Employee is skilled and experienced in the technology and production of products previously manufactured and sold by Employee and by Entek Corporation, a Texas Corporation (hereinafter "Entek"), under the trade names "Leaky Pipe" and "MICRO 2".

B. Employee is also skilled and experienced in the technology and production of products known to Banstar as "hard goods", as previously manufactured and sold by Employee and by Entek.

C. Banstar desires to employ Employee and recognizes that certain inducements must be offered to Employee in order for Banstar to retain Employee's services.

D. Entek and Employee, collectively as Sellers, and Banstar as Purchaser, have entered into a certain Asset Purchase and Sale Agreement, dated June 14, 1991 (hereinafter the "Asset Purchase Agreement"), pursuant to which Employee and Banstar have agreed, among other things, to enter into this Agreement.

NOW, THEREFORE, in consideration of the premises and the mutual covenants, agreements and promises contained herein, the parties agree as follows:

1. Employment

Banstar hereby employs Employee and Employee hereby accepts employment by Banstar as a Director of Technology for Banstar upon the terms and conditions hereinafter set forth.

2. Period of Employment

The initial period of employment (hereinafter the "Initial Term") shall commence on the date hereof and end at the close of business on December 31, 1991, unless sooner terminated

EXHIBIT H

[redacted]

as herein provided. Unless Banstar, not less than 180 days prior to the end of the Initial Term or any renewal term thereafter, serves notice on Employee of its election not to extend the period of employment, the period of employment shall be automatically renewed at the end of the Initial Term for renewal terms of one year each, each such renewal term commencing on the first day of each calendar year after the Initial Term and ending at the close of business on the last day of such calendar year, and the last such renewal term ending at the close of business on December 31, 1995. (The Initial Term and any and all renewal terms thereafter are hereinafter referred to collectively as the "Period of Employment".) Unless sooner terminated as herein provided, the Period of Employment shall, notwithstanding anything contained herein to the contrary, terminate at the close of business on December 31, 1995.

3. Services to be Rendered

Employee agrees that he shall, on a full-time basis during the Period of Employment, serve Banstar in the position set forth in Section 1 hereof faithfully, diligently, competently and to the best of his ability in conformity with the corporate policies of Banstar, as the same may be changed, amended or modified from time to time during the Period of Employment. Employee shall devote all of his business time, energy and skill to his duties hereunder. Employee shall, during the Period of Employment, serve as a Director of Technology of Banstar and, in such capacity, render such services as Banstar's Board of Directors may from time to time prescribe, including, without limitation, assisting Banstar in applying and implementing in its businesses all technologies, patents, patent rights, licenses, know-how, trade secrets, trade secret rights, proprietary information, registrations, pending applications, other intellectual property and all other assets acquired by Banstar pursuant to the Asset Purchase Agreement. Banstar may specify additional and/or different duties from time to time during the Period of Employment as the business needs of Banstar require and as determined by Banstar's Board of Directors. Employee shall initially report to Mr. Henry W. Sullivan, President of Banstar.

4. Representations and Warranties Concerning Asset Purchase Agreement

As an express condition of employment, Employee warrants and represents the following with respect to the Asset Purchase Agreement:

a. Other Agreements. The execution and delivery of the Asset Purchase Agreement and all bills of sales, assignments, and other agreements, instruments, and documents to be executed and delivered on the part of the Employee under or in connection with the Asset Purchase Agreement (hereinafter collectively the "Instruments"), do not, and the consummation of the transactions contemplated thereby and/or thereby will not, conflict with, or result in any violation of, or default (with or without notice or lapse of time, or both), or give rise to a right of termination, cancellation, or acceleration of any obligation or any lien, claim, pledge, charge, security interest, mortgage, or other encumbrance upon any of the Assets, under any provision of the Articles of Incorporation or Bylaws of Entek, or any mortgage, indenture, lease, contract or other agreement, instrument, permit, concession, franchise, license, judgment, order, decree, statute, law, ordinance, rule, or regulation applicable to the Sellers, or either of them, and/or the Assets, other than under such mortgages, indentures, leases, contracts and other agreements, instruments, permits, concessions, franchises, licenses, orders, and decrees that will, as a condition to the performance by Banstar of its obligations under the Asset Purchase Agreement, prior to the Closing Date, be fully and finally terminated and extinguished, with no continuing liability to Banstar thereunder or in connection therewith, by order of the United States Bankruptcy Court and/or by the operation of the United States Bankruptcy Code.

b. Governmental Consents. No consents, approvals, or authorizations of or filings with any federal, state, municipal, or other court, governmental body, or arbitration tribunal are required on the part of the Employee in connection with the execution, delivery, or performance of the Asset Purchase Agreement, other than such consents, approvals, or authorizations of the United States Bankruptcy Court for the Northern District of Texas as may be necessary or appropriate in connection with the Bankruptcy Proceedings, which consents, approvals, or authorizations have been obtained or will be obtained by the Employee prior to the Closing Date.

c. Liabilities. With the exception of claims now pending before the United States Bankruptcy Court in connection with the Bankruptcy Proceedings, the Employee ha no liabilities or obligations of any kind which could

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[redacted]

adversely affect the value of the Assets. The Employee does not know or have any reasonable grounds to know of any basis for assertion against the Employee of any claim or liability of any nature in any amount, other than those arising in the Bankruptcy Proceedings, that could adversely affect the value of the Assets or any part thereof.

d. Hazardous Substance Releases, Etc. The Employee has not, caused or permitted the Plant, including, without limitation, the Land, or any part thereof, to be used to generate, manufacture, refine, transport, treat, store, use, handle, dispose of, transfer, produce, process, contain, or be constructed of wastes or Hazardous Substances, except in compliance with all applicable federal, state, and local laws, rules, regulations, and ordinances, and has not caused, permitted, or authorized, and has no knowledge of the presence or release of wastes or any Hazardous Substances in, on, under, or off-site of the Entek Plant or the Land, except as disclosed in the attached Exhibit. The Plant, including, without limitation, the Land, is, and as of the Closing Date of the Asset Purchase Agreement will be, in compliance with all laws, statutes, rules, regulations, orders, decrees, governmental agreements, notices, ordinances, and directives, whether legislatively, judicially, or administratively promulgated, relating to health, safety, or the environment, or to the manufacture, storage, treatment, handling, disposal, or use of wastes or Hazardous Substances. Except as set forth on the attached Exhibit, neither the Employee has received no notice or information, including without limitation any summons, citation, directive, order, claim, litigation, investigation, proceeding, judgment, letter, or other communication, whether written or oral and whether actual or threatened, from any federal, state, or local agency or authority or any other entity or individual, whether governmental or private, concerning or alleging any intentional or unintentional act or omission, or any fact or condition that has resulted or that may result in the release of wastes or Hazardous Substances into the air, into surface or underground waters, onto or under the lands or into the environment in, on, under, off-site of, or from the Plant, including without limitation the Land or any part thereof. The Exhibit attached hereto contains a complete list of those items in or at the Plant or on or under the Land which the Employee has

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heretofore designated to third parties as "Hazardous Substances." The term "off-site" means property which is contiguous with the Land.

e. Technology. No portion of the Technology as defined in the Asset Purchase Agreement has entered the public domain or been forfeited. No person, corporation or entity has lawfully granted or has the right to lawfully grant any license, sublicense, assignment, transfer, authorization, permission or the like which may conflict with this Agreement. The application and use of the Technology by Banstar, including, without limitation, the production and sale of Pipe Product or Hard Goods by Banstar in volumes consistent with historical production levels of Pipe Product or Hard Goods manufactured at and supplied by the Plant or any part thereof at any time prior to the Closing Date, at any time or location will not infringe upon or otherwise violate the intellectual property rights of any other party.

f. Aquapore Litigation. If decided adversely to the Employee, the Aquapore Litigation would not materially and adversely effect the value of the Assets or the ability of Banstar to operate the Assets and to produce in volumes consistent with historical production all Pipe Product manufactured in the Plant or any part thereof at any time prior to the Closing Date. The Employee has no reason to believe that his respective claims in the Aquapore Litigation are, when taken as a whole, without merit, or that Banstar will not prevail in the event it elects to diligently prosecute such claims. The Employee has provided, or on or before the Closing Date will provide, all material documents and other information necessary for Banstar to prosecute as effectively as possible the Employee's claims in the Aquapore Litigation.

g. Exclusive Right to Intellectual Property. Employee hereby represents that following the closing of the Asset Purchase Agreement, Banstar will have the exclusive right, title, and interest in and to the Technology, the Marks, and the Copyrights, and that, regardless of any licenses, contracts or other agreements by the Sellers, or either of them, to the contrary, Banstar shall have legal and enforceable rights for infringement as against any other party using and/or

[redacted]

operating under the Technology, the Marks, or the Copyrights.

h. Indemnification for Environmental Matters. The Employee hereby agrees to, and hereby does, indemnify, defend, and hold harmless Banstar, its successors and assigns, from, against, and in respect of any and all claims, demands, losses, costs (including without limitation accounting, consulting, engineering, court, and appeal costs), expenses, obligations, fees (including without limitation reasonable attorneys' fees), liabilities, damages, recoveries, and judgments, that may be imposed upon or incurred by Banstar, its successors or assigns, or asserted against Banstar, its successors or assigns, by any other party or parties (including without limitation governmental or nongovernmental entities or persons) which result from or arise out of or in connection with: (a) any Environmental Conditions existing in whole or in part as of and/or prior to the Closing Date, including without limitation the exposure of any person to any such Environmental Conditions, and regardless of whether such Environmental Conditions or exposure resulted from acts or omissions of Entek or the Employee, or Entek's predecessors in interest, or other parties; (b) any Environmental Conditions caused by or resulting from, in whole or in part, Entek's or Employee's operations on or off-site of the Land (including without limitation the exposure of any person to any such Environmental Conditions), regardless of whether such Environmental Conditions existed or exist prior to, as of, or after the Closing Date; or (c) any failure or alleged failure by Entek or the Employee prior, at, or after the Closing Date to comply with any environmental, health, or safety laws, statutes, rules, regulations, decrees, orders, governmental agreements, notices, or ordinances, or interpretations thereof (including without limitation those relating to the manufacture, generation, storage, use, discharge, release, disposal, or placement of wastes or Hazardous Substances), with respect to the Plant, including without limitation the Land or any part thereof, or off-site the Land. The term "off-site" means property which is contiguous with the Land.

5. Compensation

a. Base Salary. During the Period of Employment, Employee shall be paid a minimum salary (hereinafter the

"Salary") of $100,000 per year. Base Salary shall be payable in arrears in equal monthly installments on the last day of each calendar month.

b. Performance Bonus. The Board of Directors of Banstar may, in its sole discretion adopt a performance bonus program or may grant a bonus or bonuses to Employee during the Period of Employment; the Board of Directors shall, however, have no obligation to do so.

c. Benefits. In addition to the Salary, Employee shall, during the Period of Employment, be entitled to the following benefits:

(1) Business Expenses. Reimbursement for Employee's reasonable business expenses, to the extent such business expenses are (i) within the scope of Employee's duties and responsibilities to Banstar, (ii) are consistent with Banstar's policies and procedures, as the same may be changed or modified from time to time, and (iii) are approved by the President.

(2) Other. Insurance, vacation, sick leave and pension and profit-sharing benefits and plans comparable to those to which other employees of Banstar are entitled.

6. Covenant Not to Compete

Employee acknowledges that he is a key employee of Banstar and, as such, the services rendered by Employee to Banstar are unique, special and extraordinary, and, therefore, Employee (i) has been and will be entrusted with trade secrets, technological data and materials, marketing plans and other confidential or specialized data and/or information relative to the business of Banstar (hereinafter collectively the "Trade Secrets") and (ii) has, by virtue of his work for Entek, the former owner of certain assets of Banstar, as its employee and sole shareholder, created and/or will be creating for Banstar goodwill with Banstar's customers and potential customers.

a. In consideration of (i) the disclosure to Employee of the Trade Secrets, (ii) the employment of Employee by Banstar, (iii) the compensation to be paid and the other benefits to be provided to Employee by Banstar, and (iv) the mutual covenants and obligations set forth herein, Employee acknowledges, agrees and

covenants with and to Banstar that, during the Period of Employment and for two years thereafter:

(1) Except as specifically authorized in writing and in advance by Banstar, Employee will neither use any of the Trade Secrets for his own benefit nor disclose them, unless compelled by a court or government agency of competent jurisdiction, to any other person, firm or corporation;

(2) Employee will not, directly or through any person, firm or corporation:

(a) advise, assist, confer with in any manner which would be detrimental to Banstar's interests, or render services for or on behalf of any person, firm or corporation that during the term of this Agreement is in competition with Banstar or its successors in interest;

(b) render services for any person, firm or corporation that is engaged in the irrigation or porous pipe or hard goods business;

(c) enter into or in any way assist any other person, firm or corporation in the business of producing, marketing, distributing, selling or in any other manner dealing in the same or substantially similar products as those now or previously produced by Employee and/or Entek, or in any other way engage or participate in, directly or indirectly, or in any way assist any other person, firm or corporation engaging in, any business that competes with Banstar or any of Banstar's subsidiaries, affiliates or successors in interest;

(d) solicit, entice or induce any employee of Banstar, or of any of its subsidiaries, affiliates or successors in interest, to be employed by Employee or any other person, firm or corporation;

(e) authorize or knowingly approve the taking of any of the foregoing actions by other

persons on behalf of any person, firm or corporation, or assist any such person, firm or corporation in taking such action; or

(f) solicit, entice or induce any person, firm or corporation who or which on the date hereof is, or at any time during the Period of Employment hereunder shall be, a customer of Banstar or any of its subsidiaries or affiliates to become a customer for the same or similar products or services that it purchased from Banstar, or from any of its subsidiaries, affiliates or successors in interest, of any other person, firm or corporation, and Employee shall not approach any such customer for such purpose or authorize or knowingly approve the taking of such actions by any other person.

b. Customer accounts of Banstar are and will at all times be the sole and separate property of Banstar, in which Employee has no rights whatsoever, and all activities of or work performed by Employee pursuant to this Agreement or as an employee of Banstar prior hereto and in the future were or will be performed for the benefit of Banstar and the goodwill resulting from Employee's efforts is and at all times will be the sole and separate property of Banstar, which goodwill is intended to be protected, in part, by this Section 6.

c. Should any portion of this Section 6 be declared by a court of competent jurisdiction to be unreasonable, unenforceable and/or void because the terms thereof are unduly broad, of too long a duration in time, or for any other reason, the court involved shall modify the applicable provision(s) of this Section 6 so as to be reasonable, so as to provide for a term or scope that is the maximum that court will permit, or as is otherwise necessary to make this Section 6 enforceable and valid to the maximum extent possible.

d. Employee acknowledges that it is impossible to measure in money the damages that will accrue to Banstar should Employee fail to abide by the provisions of this Section 6. Therefore, if Banstar should institute any action or proceeding to enforce any provision of this Section 6, Employee hereby agrees that the court in such action may grant injunctive relief, and Employee hereby

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waives the claim or defense therein that Banstar has an adequate remedy at law.

e. The provisions of this Section 6 hereof shall survive the termination of this Agreement, irrespective of the reason therefor.

7. Termination

Notwithstanding anything contained herein to the contrary, Banstar shall have the following rights with respect to termination of Employee's employment; provided, however, that nothing contained in this Section 7 shall in any way affect or impair the right of Banstar to terminate the Period of Employment, for any reason or for no reason, pursuant to the terms and conditions set forth in Section 2 hereof:

a. Death. If Employee dies during the term of this Agreement, Employee's employment shall thereby be terminated on the date of death.

b. Disability. If Employee shall become unable to perform the duties under this Agreement, as measured by Banstar's usual business activities, due to physical or mental disability or other incapacity that can be expected to result in Employee's death or to be of duration longer than ninety (90) days, Banstar shall have the right, upon written notice to Employee, to terminate Employee. Determination of disability or incapacity shall be determined by the Board of Directors of Banstar.

If within ten (10) days of written notice referred to above, Employee shall notify Banstar in writing that he disputes Banstar's determination of his disability, Banstar and Employee shall each name a physician who is a member of the American Medical Association ("AMA") to examine Employee and determine if his physical and/or mental condition is such as to render him incapable of performing the usual duties of his employment with Banstar. The two physicians so selected shall select a third physician who is a member of AMA, and after each completes his examination of Employee, the decision of said group of three physicians shall be certified in writing to Banstar and Employee, and said decision shall be binding and conclusive upon Banstar and Employee. If Employee shall fail to notify Banstar within the ten (10) -day period herein prescribed that he disputes Banstar's determination of disability, then Banstar's determination

thereof shall be final and conclusive and Employee's employment shall terminate.

c. Cause. Employee may be terminated for cause, which shall include, but not be limited to, the following:

(1) any conviction of a felony involving moral turpitude or dishonesty; or

(2) any material breach by Employee of his obligations, covenants, agreements or warranties under this Agreement; provided, however, that Banstar shall give Employee written notice specifying the nature of the breach and shall allow Employee a reasonable period of up to thirty (30) days to cure the breach prior to termination under this Subsection 7c(2); or

(3) any commission of a material act of malfeasance, dishonesty, or breach of trust against Banstar.

d. Effective Date. In the event termination occurs pursuant to Subsection 6a hereof, the termination shall be effective on the date of death and all compensation and benefits described in this Agreement shall cease upon the effective date. In the event termination occurs pursuant to Subsection 7b hereof, the termination shall be effective as of the last day of the calendar month of the final and conclusive determination of disability, and all compensation and benefits described in this Agreement shall cease upon the effective date of termination. In the event termination occurs pursuant to Subsection 6c hereof, termination shall be effective upon notice being given to Banstar and all compensation and benefits described in this Agreement shall cease as of such date of termination.

e. Termination by Employee. In the event that the employment of Employee is terminated at Employee's own request, Employee shall give Banstar no less than six (6) months prior written notice, and Employee's right to compensation, as herein provided, shall be terminated thereby as of the effective date of such termination.

8. Exclusive Services

Except as expressly provided in this Section 8, as long as Employee is employed by Banstar, Employee shall not, directly or indirectly, enter the employ of any other person, firm or corporation, and shall not himself engage in any business on his own account without the prior written approval of the Board of Directors of Banstar in each and every instance; provided, however, that the provisions of this Section 8 shall not prohibit Employee from (1) making passive investments and/or (2) earning outside income from other activities so long as such activities do not interfere with Employee's performance as a full-time employee of Banstar or violate Employee's covenant not to compete set forth in Section 6 hereof.

9. No Other Benefits or Compensation

Employee shall, as a result of his employment by Banstar, be entitled to only the compensation and benefits provided for in this Agreement, subject to the terms hereof, and no others.

10. Waiver Provisions

The failure of Banstar at any time to require performance by Employee of any covenant or obligation of Employee pursuant to any provision of this Agreement shall in no way affect Banstar's right thereafter to enforce such provision; nor shall the waiver by Banstar of any breach of any provision of this Agreement be taken or held to be a waiver of any succeeding breach of any such provision or as a waiver of any other provision hereof.

11. Water West Adversary Proceeding. The Employee is the Debtor-in-Possession under a certain voluntary bankruptcy petition filed under Chapter 11 of the United State Bankruptcy Code by the Employee on July 2, 1990, which action is now pending before the United States Bankruptcy Court for the Northern District of Texas, Dallas Division, as Case No. 391-31144-HC-A-11. Water West has filed an adversary proceeding with respect to dischargeability under Bankruptcy Code §523 concerning a judgment it previously obtained against the Employee. Banstar has agreed to pay any future costs of representation of Employee in the adversary proceeding so long as Employee remains employed by Banstar and is not in breach of this Employment Agreement.

12. No Conflicting Agreements

Employee represents and warrants that he is not a party to any agreement, contract or understanding, whether employment or

otherwise, which would in any way restrict or prohibit him from undertaking or performing employment in accordance with the terms and conditions of this Agreement.

13. Entire Agreement; Amendments

This Agreement and the Asset Purchase Agreement contains the entire understanding of the parties hereto with respect to the subject matter hereof. Any prior statements, negotiations, representations, understandings, proposals or agreements relating to the subject matter hereof, other than those set forth in the Asset Purchase Agreement, shall be deemed to be merged into this Agreement, and to the extent inconsistent herewith, shall be deemed to be of no force or effect. There are no warranties or agreements, express or implied, oral or written, with respect to the subject matter hereof, except as set forth in this Agreement and in the Asset Purchase Agreement. No alteration, amendment or modification of any of the terms or provisions hereof shall be valid unless made pursuant to an instrument in writing signed by the parties hereto.

14. Notices

All notices, requests, demands, and other communications hereunder shall be in writing and shall be deemed to have been duly given if delivered personally or mailed, first class, postage prepaid, certified mail, return receipt requested, to the other party at its or his address as set forth at the beginning of this Agreement or to such other address or addresses as either of the parties may designate in conformity with the foregoing.

15. Section Headings

The section and subsection headings contained in this Agreement are for reference purposes only and shall not affect in any way the meaning or interpretation of this Agreement.

16. Successors and Assigns

This Agreement shall not be assignable by Employee. Subject to the foregoing, all of the terms and provisions of this Agreement shall be binding upon and inure to the benefit of and be enforceable by the respective heirs and personal representatives of Employee and the successors and assigns of Banstar.

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17. Severability

If at any time subsequent to the date hereof, any provision of this Agreement shall be held by any court of competent jurisdiction to be in any way illegal, void or unenforceable, such provision shall remain in effect to its fullest extent after excising the invalidating feature of the provision. The illegality or unenforceability of such provision shall have no effect upon and shall not impair the enforceability of any other provision of this Agreement.

18. Interpretation. This Agreement shall be governed by and construed in accordance with the internal laws of the State of Texas. Whenever the context requires, the singular shall include the plural, the plural shall include the singular, the whole shall include any part thereof, any gender shall include both other genders, and the term "person" shall include any individual, firm, corporation, partnership, trust, or other entity or combination thereof.

19. Venue. The obligations and undertakings of each of the parties to this Agreement shall be performable in Harris County, Texas.

20. Attorneys' Fees. In the event either party hereto shall commence any legal action or proceeding with respect to interpretation of this Agreement or to enforce its or his respective rights as set forth in this Agreement, the party prevailing in such action or proceeding shall be entitled to court costs and reasonable attorneys' fees incurred by such party in bringing and/or defending such action or proceeding.

21. Counterparts. This Agreement may be executed in any number of counterparts, each of which when executed and delivered shall be deemed to be an original, and all of which shall together constitute one and the same instrument.

IN WITNESS WHEREOF, the parties hereto have duly executed this Agreement as of the day and year first above written.

BANSTAR:

Banstar Corporation

By _____
Henry W. Sullivan
President

EMPLOYEE:

_____
James E. Turner

BANSTAR CORPORATION
10,000 Memorial Suite 900
Houston, Texas 77024

August 7, 1991

Mr. James E. Turner
Box 929
Conroe, Texas 77305

Dear Jim:

In consideration for your agreement to accomplish the transfer of porous pipe technology to Banstar no later than August 15, 1991, we agree that we will cause a check to be issued to you in the amount of $75,000.00 immediately upon completion of the technology transfer, which you have agreed to accept in full settlement and release of our employment obligations to you pursuant to the June 14, 1991 Employment Agreement.

Both parties agree that your obligation to transfer the porous pipe technology will be accomplished when you have demonstrated in the presence of Banstar's designated representatives at least two production lines producing specification product at design capacity for a period of three consecutive days, together with your answering to Banstar's satisfaction all technical questions propounded by its representatives. Banstar will further be able to schedule environmental sampling during the demonstration period.

This letter also serves as notification of termination of the agreement and by your signature hereto, your agreement to that termination and agreement to release any further claims you might have for performance by Banstar under that Employment Agreement.

This agreement to pay and subsequent payment is made for the further consideration of your promise to make best efforts to cause Mr. Roy Kendall to continue as a full-time employee of Banstar or its successor for at least six (6) months from the date of closing of the Turner and Entek Asset Sale, and that during such period, you will make your best efforts to insure that Mr. Kendall will fully disclose to Banstar his knowledge of the porous pipe technology and operations.

Very truly yours,

Henry Sullivan

ACCEPTED AND AGREED:

James E. Turner

EXHIBIT
1

POPE, SHOEMAKE, SELWYN, KERR & DE NISCO
ATTORNEYS AT LAW
AN ASSOCIATION INCLUDING PROFESSIONAL CORPORATIONS
1800 BERING DRIVE, SUITE 600
HOUSTON, TEXAS 77057
TELEPHONE (713) 783-3110
FAX (713) 783-2809

RAYMOND C. KERR

OF COUNSEL
HONORABLE HAROLD R. SHOEMAKE
HOUSTON, TEXAS

November 14, 1991

Re: Turner/Entek

John Flowers, Esq.
540 Founders Square
900 Jackson Street
Dallas, Texas 75202-4425

Via Telecopier (214) 747-2439

Dear John:

Attached is a newsletter evidently being put out at Jim Turner's direction. This is being forwarded to you for your information.

Turner is no longer employed by Banstar, which is in the process of changing its name to GAIA Technologies, Inc. Turner has no manufacturing capability for porous pipe. Neither does Recycled Products Corporation, the address of which is Turner's address in Conroe, where my client has physically inspected the premises.

The product he is purporting to offer for sale nationwide in this letter can only be former inventory of Entek Corporation, which must have vanished from the premises during the Chapter 11 administration period prior to the asset sale to Banstar.

Banstar has never obtained the books and records of Entek, which were part of what it bought pursuant to the Asset Purchase and Sale Agreement. As you are aware, the primary reason Banstar wanted those books and records was to find documentary support for its motion which is now pending for the advancements it made to Entek. Banstar has serious questions concerning whether the monies it advanced to Entek were actually used by Entek for the purposes for which the monies were advanced. Your assistance in obtaining these records would be greatly appreciated.

Additionally, it appears that a significantly quantity of assets disappeared from the Entek premises after my client did its original due diligence in March and April before making the offer to purchase the assets of Entek and after the assets were delivered. My client is preparing a list of those assets to the extent its personnel can. However, it is difficult to compile such a list without access to the books and records of Entek.

EXHIBIT
J

My client is reviewing its legal remedies with respect to the use in this material of our "Leaky Pipe" trademark and other material which this communication contains. This communication has been distributed nationwide to former customers of Entek. From the perspective of the Debtor's estate, you may wish to inquire further into some of the issues raised in this letter.

Very truly yours,

Raymond C. Kerr

RCK/dt
Encl a/s

cc: Robin Phelan (with attachment)
Henry Sullivan

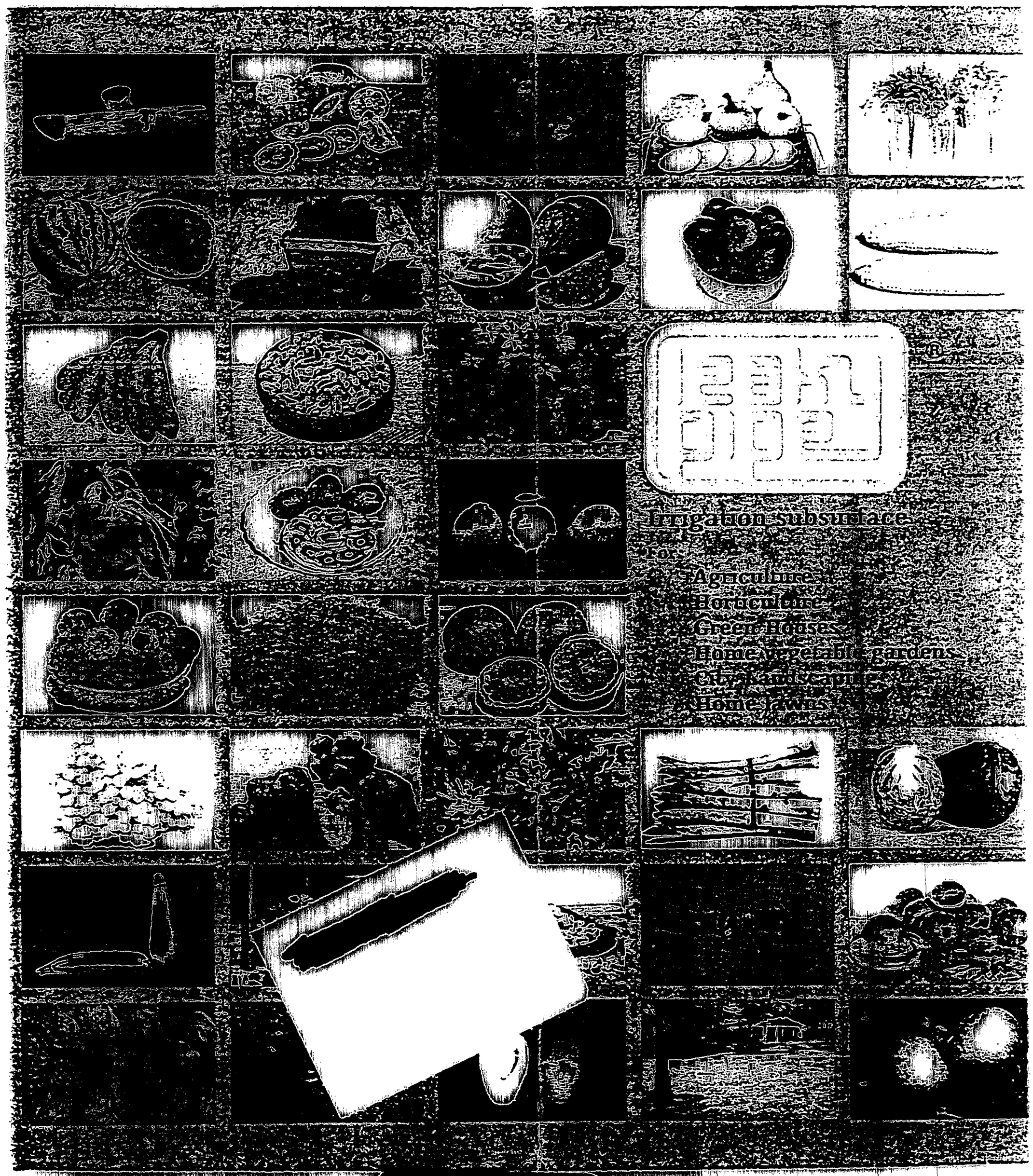
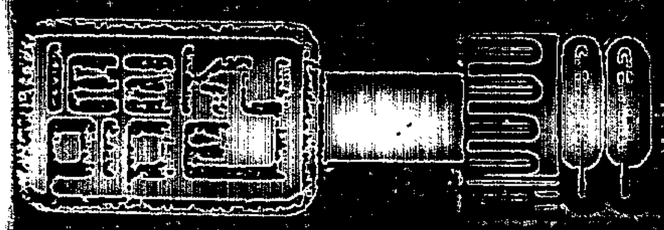


EXHIBIT
K

LEAKY PIPE



Name		Street or P.O. Box	
City	State	Zip	Telephone

I am [ ] Grower [ ] Farmer [ ] Technician [ ] Importer/agent [ ] Other _____

My crop is

I am interested in irrigating _____ hectares or _____ acres

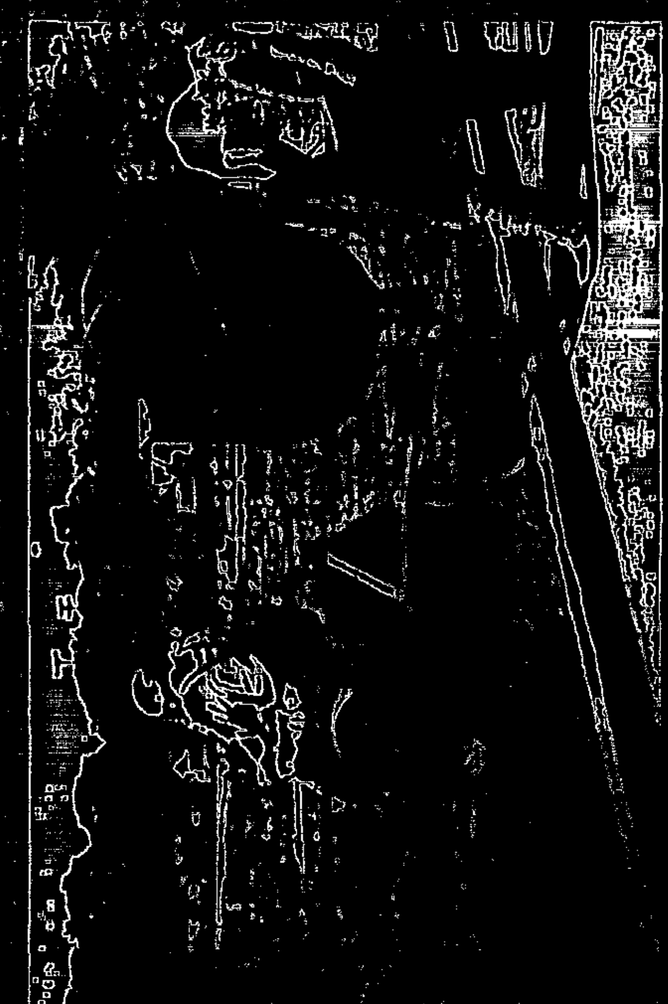
The daily water requirements of the crop is

The water source available is [ ] well [ ] lake [ ] river [ ] canal [ ] other _____

The soil is [ ] sandy [ ] loam [ ] clay [ ] other _____

Other information I would like to give

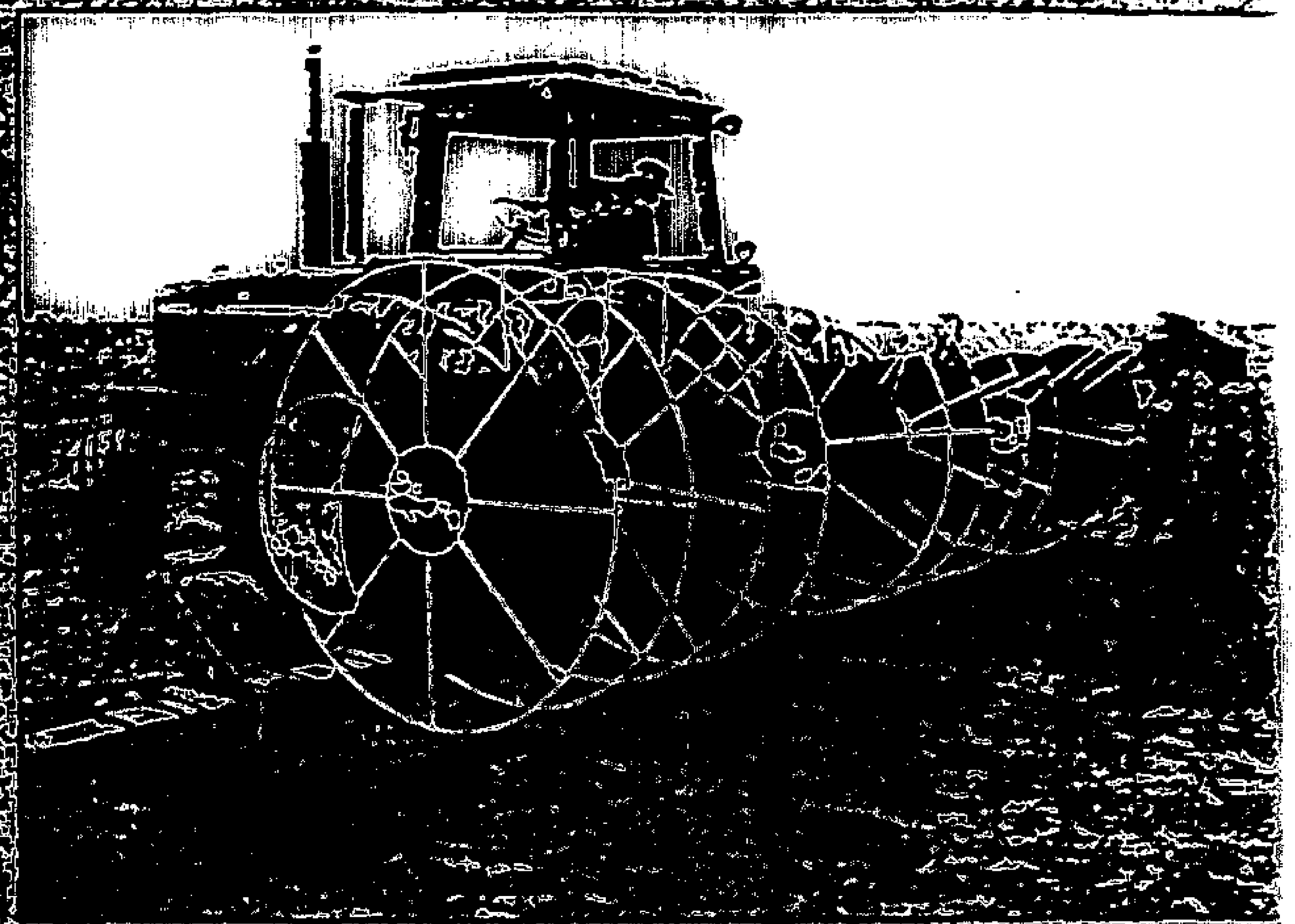
Special information I would like to receive



SUMMARY OF [illegible] LEAKY PIPE® ADVANTAGES

1. The subsurface watering advantage is [illegible]. Roots are trained down deep. A $100 root system on a $5 tree will soon result in a $100 tree above ground.
2. The underground connection saves about one-half on watering costs — virtually no evaporation, no run-off. The water saving is so strong we are exempt from rationing in many areas. (Whether we are exempt or not is academic because no one can see you watering.) In small yards, the flow is often too low to kick the city meter.
3. Maintenance is much less. No sprinkler heads to replace, nothing above ground.
4. Whereas sprinklers are a disaster on slopes, water coming up from the ground is a genuine blessing.
5. The underground method proves advantageous in water where the salt content is high. For openers, using half the water would deposit only 50% of the salt of old fashioned methods, plus, subsurface the salinity is washed down to lower levels instead of being deposited on the surface.
6. Leaky Pipe® is totally automatic. You won't like Leaky Pipe® if you enjoy seeing sprinklers during a rain storm.
7. Installation does less damage to turf. In new lawns installation is even easier. We manufacture an inexpensive machine that lays the pipe quickly.
8. For the installer, Leaky Pipe® is profitable and very competitive with sprinklers—in fact we can undersell them.
9. The Leaky Pipe® System has its own meter. The user can document the exact amount of water used. [illegible] sprinkler system, you would not enjoy the meter [illegible]
10. [illegible]

[illegible]



[illegible]

COMMENTS BY A GROWER AND USER OF LEAKY PIPE FOR THREE YEARS

This revolutionary irrigation system has worked several [illegible] many [illegible] agriculture and [illegible] all over the world. This [illegible] shared by a number of agricultural professors and irrigation technicians [illegible] will be a boon [illegible] the same time water [illegible]

[illegible] YOUR [illegible] DEALER

RECYCLED PRODUCTS CORP.
212 Garden West
Conroe, Texas 77304-1604
409-756-6511
FAX-409-756-6552

(4)

S FROM;

November 8, 1991

RECYCLED PRODUCTS CORP. - 212 GARDEN WEST - CONROE, TEXAS 77304-1504
Phone 409/756-6511 Fax 409/756-6552

THE BEST LEAKY PIPE FOR LESS!

With the most advanced technology, RPC can now supply you with all the porous pipe you can use for a simple pricing structure: truckload lots @ $.05 per foot; in less than truckload, but no less than 100,000 feet @ $.06 per foot. Delivery is immediate and you do not need to ever pay more than $.06 per foot.

For all orders within the next 30 days, any amount of Leaky Pipe (50,000 ft. and up can be purchased for $.04 per foot. All orders are FOB Conroe, Texas. To help folks make the transition, we are offering 3/8" Inside Diameter and 5/8" Inside Diameter for the same price. We will presently absorb the difference. By mid-1992, we expect to be producing a 1/2" ID only and at the cheap price!

This represents a new marketing philosophy for us. No formal distributors with a contract; sell it direct and sell it cheap in volume. We have discarded the idea of defending our technology in the courts and coupled with the fact that no one has successfully copied our technology (Jim Turner's original invention and development), we have decided to defend ourselves in the market place, to wit: sell it high quality, sell in volume and sell it cheap!

How do you become a dealer? Join the Dealer Club for $100. Like Sam's Wholesale Club, you can buy any amount of Leaky Pipe for $.05 per foot through 1992. This membership buys you this unlimited buying privilege.

At these prices, we will not be able to afford travel across the country, as in the past and hold your hand. We can offer you telephone advice and an installation Manual. And there are independent operators who will come for a fee and help. Also, there is a growing army of people out there who really know how to install this stuff. It ain't complicated if you follow the four simple principles of installation.

THE TUBS

The famous five-gallon tub is still available in colors ($2) made from bottle caps and black old tire material ($1.75). Some LP dealers find that the tub is a good door opener, plus it helps carry your overhead. Sams or K-Mart do not carry anything like it. This is not a throw away tub; it is a keeper and it is made from recycled trash; your trash, my treasure.

1" x 12" BOARDS MADE FROM OLD TIRES & FLUFF

By next spring or early summer we will have available boards for back yard fences and decks. Beautiful, competitive and guaranteed for life! Shortly, we will have available the best roof on the world market; impervious to hail, fire and time! We need just a note from you saying that you are interested. We will put it in our files and get back to you in a short time.

WHATEVER HAPPENED TO JIM TURNER?

For the past 20 years, he has worked day and night to develop and invent products from our waste. Leaky Pipe is one of those products. The hardgoods, which includes boards, roofing, guard rail posts, railroad crossties, transformer pads, etc. are part of this development. He worked these 20 years without salary. The company covered his bare expenses. He always put everything back into the company for research and development. Consequently, he was not able to accumulate any savings. There always seemed to be just barely enough to get by. With the death of the banks in the U.S., it was even tougher to move forward. But he was moving forward. 1990 was to be the first year to turn a profit. However, that was interrupted in July 1990.

Water West, a defunct (in bankrupcy since 1985) company had gotten a default judgement against Jim and Entek in 1982. They claimed that Jim had violated the Agreement by selling in their territory. Jim did make a sale in their territory, but only after they had closed down their operation and he had cancelled their Agreement. Later, he still tried to revive them and turn the sale over to them. He did not know that they had secretly gotten a default judgement in a Las Vegas Court. And from that point they waited in silence for the magic moment to strike. The time: July 1990

Mr. Reid Enniss, now President of Water West (in bankrupcy since '85) signed an affidavit that Jim Turner & Entek owed him $2,500,000. He brought that affidavit (not a judgement of a legitimate court) to a one Judge John Marshall, State District Judge in Dallas. In violation of Texas law, "Judge" Marshall would not hear any evidence nor in any small way would he hear the merits of the case. On a default judgement brought in from out of state, Texas law rightfully requires a hear[illegible]nce the victim has not ha[illegible] process or otherwise his day [illegible]ead about in the civic book[illegible]

EXHIBIT

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RECYCLED PRODUCTS CORPORATION
212 Garden West
Conroe, Texas 77304-1504

February 1992

To our Thousands of Supporters:

Some of you go back literally 20 years when we first commenced to invent products from old tires and fluff (Fluff is the soft inside of automobiles which is vacuumed out before the metal is shredded). Some of you have become acquainted with our efforts just in recent years or months. All of you are appreciated beyond my ability to express it. We finally developed a porous pipe which leaks evenly and is the standard of the world. We have sold in 54 countries. So far as we know, every imitator who uses old tire crumb in the process has either stolen our process or bought it from someone who has stolen it. But no one has successfully copied Leaky Pipe. It may look like the real thing; it may taste like the real thing; it may even feel like the real thing. Bury it in the ground. You'll find it isn't the real thing!

The Porous Pipe is just one of several products we have developed made from old tire crumb and fluff. Over the past 15 years, I have conducted a weekly seminar at our old facility in Southlake, Texas. By our own records, 16,192 of you attended one or more of these meetings. You have heard me tell of the other products that have been in limited production and would have been in full production since 1986, if the U.S. banking system had not been destroyed by the greed of the bankers, the Congress and the President.

Before we get on the subject of the "Other Products", you can buy Leaky Pipe for $.05 per foot in truckload lots or simply $.06 per foot in less than truckload lots (FOB Conroe) Warrantied and guaranteed. Why pay more for a poor copy when you can buy the real thing?

OTHER PRODUCTS AVAILABLE

Microtwo, the absolutely best Fine Bubble Diffuser for sewer systems and fish farming (any situation where the need is to raise the dissolved Oxygen level of water efficiently) Most of the fish farms throughout the world use our product. 1" I.D. sells for $1.00 per foot; 5/8" I.D. sellsfor $.50 per foot; 3/8" I.D.sells for $.35 per foot and the 1/4"sells for $.25 per foot, FOB Conroe.

Five Gallon Tubs for fruit & veg gathering, washing your car, soaking tired feet, feeding livestock, etc. etc. You can't beat it! Can't buy one like it at Walmart, K-Mart or Sams. Should retail for more than $9.95. You pay and peddle to feed stores, country grocery stores, deliver and collect on spot. A talented peddler could make up to and more than $1,000 daily, all cash. Actually a $1,000 per week would not be all so bad. You need a pickup, a good trailer to pull behind it and about $2,000 working capital. No loss is guaranteed. If it is not your 'cup of tea', we'll just buy your inventory back, if you will unload. Your cost on the tubs is $2 for miscellaneous and mixed colors; $2.50 for solid colors.

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Phone 409/756-6511 [illegible]2

Our Technology is the most advanced in the world for turning Petro[illegible]e into world-class consumer products.

OTHER PRODUCTS SOON TO BE AVAILABLE

Lifetime Fence Posts: 4" in diameter x 6½' high, as well as several sizes of sq. posts, made from crumbed auto tires and fluff. Send $100 now to place reserve order for 25 posts from our initial production. We have already produced 640,000 of these posts. Our customers love them because they never rot, nails/staples won't pull out over time, the posts have a memory, they are attractive, they take a paint job better than wood and last but not least, we are helping the environment.

1" x 12" Boards: they never rot or wear out. They're great for truck/trailer floors, super for decks/porches, the most gorgeous back yard security/privacy fence possible.

Roofing Shingle: non-combustible, laughs at a hail storm, handsome in every way, can be painted to color coordinate the outside of your home and it is a once-in-a-lifetime installation.

Guard Rails and Guard Rail Posts, Conveyor and Transformer Pads: these and several other items are not for consumers and will be sold by our in-house marketing division. Keep your eye on the road as you will begin to see the Guard Rail system in use on our highways and streets. Our Guard Rail System will save lives, perhaps hundreds annually, and will save our trees. Ms. Susan Dieson will head up sales of the Guard Rail System to all market areas.

Miscellany: There are several of the Mobile Units available from ex-Leaky Pipe Dealers scattered around the country. Call for availability in your area. If you want to be informed when any or all of our products are available, write us and we will put your letter in a file folder for reference at the right time. We will contact you.

RPC PRICE LIST SUMMARY [Notice we give small/big buyer same advantage]

Leaky Pipe in truckloads $.05/ft.; less than truckload @ $.06. Our goal in 1993, is to drop to the low of $.04 for truckloads.

Best Trencher, 8 h.p. IC engine, electric starter, adjustable depth up to 12". $2,500. Compare to competitor's $4,000. All purchases before May 1st, we pay freight to you. Comes with extra blade.

MicroTwo: see fourth paragraph on first page.

5 Gallon Tub: see last paragraph on first page. Phone, fax or write and we will send you ten mixed color tubs for $20 plus freight/COD.

The Buyer's Club: Alex Coutts in California became our 307th member today. The deal: For $100 in membership fees (like Sam Walton does at his "Sams") this give you a buying advantage and helps us finance our growth, since there are no banks around anymore. You get to buy Leaky Pipe, any amount, for $.05 per foot, FOB factory, all of 1992! Add it up, if you are going to buy more than 10,000 feet in 1992, then you would gain by joing the LP Buyer's Club.

Jim Turner

Consultant to Recycled Products Corporation

TEL: 1-800-259-1367
1-409-830-1367
FAX: 1-409-830-8546

R E T E K

RECONVERSION TECHNOLOGIES
of Texas, Inc.
1709 Highway 36 North • Brennam, TX 77833

Authorized Distributors
Wholesale Price List
Effective January, 1993

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ETURNA POST

Round	Total Weight	Less Than Truck Load	Truck Load
2" x 84"	5#	2.45	2.00
3" x 84"	12#	3.60	3.00
4" x 84"	20#	4.80	4.50
7" x 96" (reinforced) "Superpost"	61#	14.00	12.00
Square			
4" x 4" x 84"	28#	5.80	5.50
Rectangular			
4" x 6" x 84"	38"	8.96	7.79
ETURNA LUMBER & FENCING			
1 1/4" x 6" x 16' Decorative Horiz. Board	27#	7.89	7.59
1 1/4" x 12" x 12' (Lap and Gap)	40#	11.00	10.00
1 1/4" x 6" x 72" Picket	12#	3.60	3.00
24" x 1 1/4" x 72' (round top) Quad Picket	26#	11.00	10.00
24" x 72" Horiz. Board x 1 1/4	26#	23.00	20.00
6" x 6" x 96" (grooved) Super Post / Fence Post (reinforced)	65#	23.00	20.00
6" x 6" x 144" (grooved, reinforced fence post) Super Post (noise abatement)	98#		30.00
ETURNA PALLETS AND PADS			
Shipping Pallet 4" x 4" 2500# Cap	40#	11.00	10.00
In House Pallet 5000# Cap	50#	32.50	30.00
In House Conveyor Pad 4' x 4'	50#	32.50	30.00
Air Conditioning Pads 3" Thick	3.3#	1.68 Sq. Ft.	1.50 Sq. Ft.
Transformer Pad 42" x 42"	40#	32.20	30.00
LEAKY PIPE			
1000' Roll - 3/8 ID	40#	.07 Ft.	.05 Ft.
5 Gal. Utility Tubs		3.00	2.75

EXHIBIT
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ONLY FOR "MOTHER EARTH

LIMITED TIME OFFER

Our founder is the ORIGINAL inventor of the Recycled Tire Soaker Hose, and has produced the highest quality Porous Watering hose for over 20 years.

"NOW-NEW TECHNOLOGY"

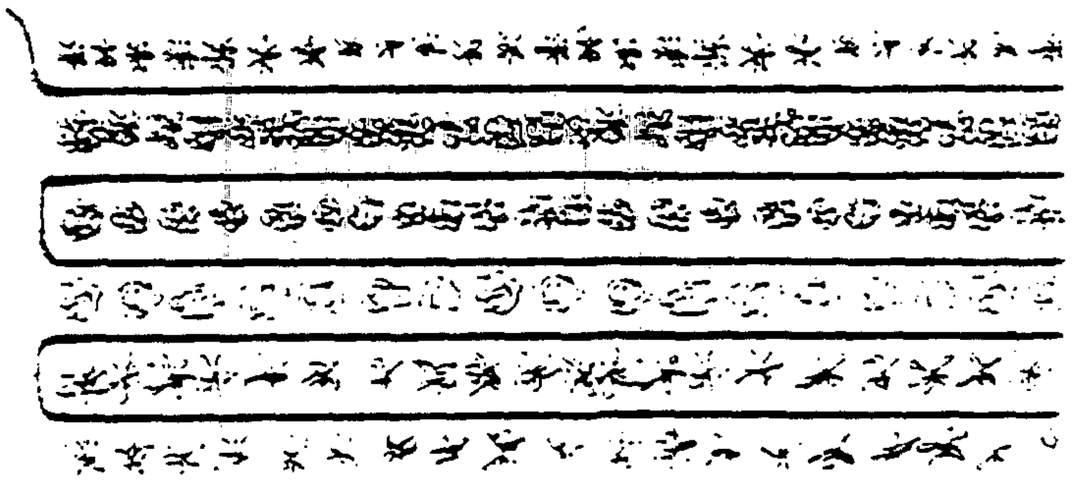
makes our hose the ultimate watering device. No other hose can matcl our latest improvements. This great soaker hose can be buried or laid on top of the ground in your flower beds or vegetable gardens.

GUARANTEED EVEN LEAKAGE OVER ENTIRE LENGTH

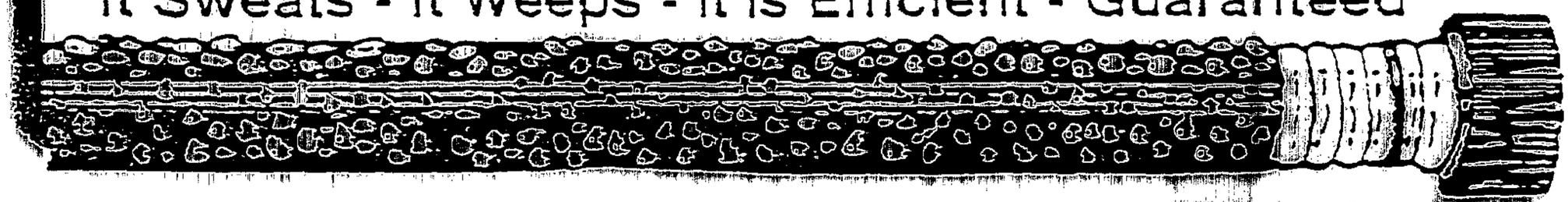
ADVANTAGES TO YOU:

1. Water at the roots where it is needed.
2. No wasted water - lower bills.
3. Increases production by constant "just enough" watering of flower or vegetables.
4. Eliminates erosion.
5. Fruit trees and vines thrive with even watering.

50 FT. OF HIGH TECH HOSE COMPLETI WITH FITTINGS. JUST ADD TO YOUI REGULAR HOSE OR DIRECT TO FAUCETS.



"It Sweats - It Weeps - It Is Efficient - Guaranteed"



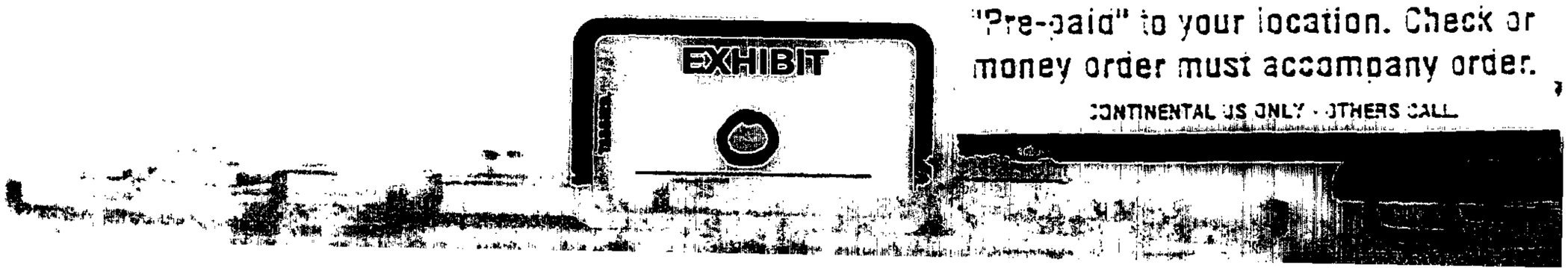
* LIMITED OFFER *

Regular Price	$12.95
*Less	$2.00
Your Price	$10.95

"Pre-paid" to your location. Check or money order must accompany order.

CONTINENTAL US ONLY - OTHERS CALL

EXHIBIT



RETAK

RECONVERSION TECHNOLOGIES
of Texas, Inc.

RECEIVED OCT 3 1 1992

October 29, 1992

Mr. Ken Martin
2800 Hirschfield #51
Spring, Tx. 77373

Dear Mr. Martin,

Congratulations, You have made a very wise purchase. Our "Leaky Pipe" irrigation hose will turn out to be one of the best investments made in your lifetime. "Leaky Pipe" will change the way that you water your garden, your shrubs, your foundation plantings. "Leaky Pipe" waters with at least 70% less water and at the same time offers the healthiest way to do your watering.

Be sure to turn your water on only the equivalent of a drip. As soon as the hose fills--it starts to sweat. This sweating is all that is needed. Through natural capillary action the water will spread to an average width of 3 to 4 feet. Your "Leaky Pipe" can be wound in around your shrubs or up and down vegetable rows. Note that the water "sweats" without spurting. JUST TURN IT ON AND LEAVE IT ON. You can cover your "Leaky Pipe" for additional savings from evaporation.

We know that you are going to be VERY EXCITED with this great product, and we are willing to MAKE YOU AN OFFER THAT YOU SHOULDN'T REFUSE.

We will extend to you 1 additional purchase of "Leaky Pipe" at the reduced "MOTHER EARTH" DISCOUNT. We will allow the purchase of up to 12 hoses at this special price. The coupon at this side of this letter must be used for this purchase.

ONLY WITH THIS COUPON

Please send me____50' rolls of the "Mother Earth" special soaker hose.

Name _____ ____ x $10.95

Address _____ Total -

City _____ State _____ Zip _____

RECONVERSION TECHNOLOGIES OF TEXAS
1709 Hwy 36 North • Brenham, Texas 77833 • Phone: (409) 836-1367

We hope that you will take advantage of this offer, while we can offer it. Remember THIS ORDER WILL PRE-PAID TO YOUR HOME ONLY DURING THIS OFFER.

We have included with your order a very comprehensive book that will explain all of the technical information that you will ever need to get the most of your "Leaky Pipe".

Sincerely,

Burt L. Coty
Director of Marketing

EXHIBIT P

ONLY WITH THIS COUPON

Please send me 1 50' rolls of the 'Mother Earth' special soaker hose.

Ken Martin

Name

2800 Hirschfield #51 — 1 x $10.95

Address

Spring Tx 77373 — Total - 10.95

City State Zip

RECONVERSION TECHNOLOGIES OF TEXAS

1709 Hwy 36 North • Brenham, Texas 77833 • Phone: (409) 830-1367

KEN OR AMY MARTIN
LIC. 12768413 13443737
2800 HIRSCHFIELD, APT. 51 PH. 713-355-9346
SPRING, TEXAS 77373

1150

Oct 27 1992

38-7066 / 3149 | 35

Pay to the order of Reconversion Technologies of Texas | $ 10.95

Ten dollars & 95/100 Dollars

GUARANTY FEDERAL BANK F.S.B.
HOME OFFICE: DALLAS, TEXAS 75225
PROCESSING CENTER: AUSTIN, TEXAS
HOUSTON BANKING CENTERS

Memo

Ken Martin

⑈314970664⑈ 004001874⑈ 1150

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RECONVERSION TECHNOLOGIES
of Texas, Inc.

IMPORTANT INFORMATION

Throughout this manual you will find the reference to "ENTEK" 33 times. James Turner, the present Chairman and Chief Operating Officer of "RETEK" (Reconversion Technologies of Texas) is the author of this book. He is the inventor of Leaky Pipe and developer of the concept of Subsurface and continuous moisture maintenance.

"ENTEK" IS NO LONGER AN OPERATING ENTITY.

"RETEK" under the guidance of James Turner, has developed, through advanced technology a far more advanced porous pipe than was previously offered by "ENTEK"
". Patents on this great new and advanced technology are in the application stage now.

Porous pipe made according to this advanced technique is being produced by "RETEK" and will be produced at the rate of 1,000,000 feet per day by mid 1993.

Installation procedure and other technical questions concerning porous pipe, should be directed to JAMES TURNER at the below listed address.

RETEK
1709 HIGHWAY 36 NORTH
BRENHAM, TEXAS 77833
PHO-409-830-1367
FAX-409-830-8546

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